

1	2	3
(1) 0	(1) 9	(1) 4
(2) -6	(2) 27	(2) 4
(3) -17	(3) 25	(3) -4
(4) 1	(4) -27	(4) -4
(5) 11	(5) -25	(5) 1
(6) 13	(6) 25	(6) 27
(7) 17	(7) -27	(7) $-\frac{1}{27}$
(8) 3	(8) 27	(8) $\frac{1}{24}$
(9) -25	(9) -25	
1	2	3
(9) $-\frac{1}{4}$	(10) 16	(9) 16
(10) $\frac{1}{2}$	(11) 16	(10) 32
(11) -3	(12) -16	(11) 1
(12) 3	(13) 4	(12) $\frac{2}{3}$
(13) 24	(14) $-\frac{1}{3}$	(13) $\frac{2}{3}$
(14) $-\frac{3}{5}$	(15) -48	(14) -9
	(16) 1	(15) -16
		(16) $\frac{1}{9}$

4	5
(1) -34	(1) 7a
(2) -10	(2) 3a
(3) 21	(3) -a
(4) -7	(4) 0
(5) -14	(5) 2x - 3
(6) 1	(6) a + 4b
(7) -3	(7) $-\frac{1}{6}x$
(8) 0	(8) $\frac{5}{6}a - \frac{1}{3}b$
4	5
(9) $-\frac{13}{24}$	(9) $\frac{5}{2}ab$
(10) $\frac{3}{5}$	(10) $4x^2 + x - 1$
(11) $-\frac{1}{15}$	(11) $\frac{7}{6}a^2 + \frac{5}{12}a$
(12) $-\frac{1}{2}$	(12) 4a + 2b
(13) $-\frac{31}{40}$	(13) -4x - 12
	(14) 7a - 5b
	(15) $-\frac{2}{3}x - \frac{5}{4}y$
	(16) -15y

10 (4-6 min)

6

(1) $\boxed{6}x - \boxed{2}$

(2) $-x + 2y + 2$

(3) $-y$

(4) $4x + 5$

(5) -3

(6) -7

(7) $4x + 8$

(8) $-4b - 8$

7

(1) $10a - 20b$

(2) $-2x + 4y$

(3) $-15x + 5y - 10$

(4) $x + 2$

(5) $8x - 11$

(6) $2x + 30$

(7) $-8y$

8

(1) $\frac{x + 16}{4}$

(2) $\frac{9x + 8y}{12}$

(3) $\frac{3x + y}{6}$

(4) $-\frac{7}{12}$

(5) $\frac{19x + 7}{18}$

6

(9) $2x + 4y + 3$

(10) $-a - 5c$

(11) $16y - 4$

(12) $5a - 4b$

(13) $2x + y$

(14) $6a - 5b - 8$

(15) $3b + 3$

(16) $-4a + 3c$

7

(8) 2

(9) $\frac{2}{3}a - \frac{1}{3}b$

(10) $4a - 2b$

(11) $9a + 10$

(12) $x + 4$

(13) $-\frac{1}{2}a - \frac{2}{3}b$

(14) $x + 4$

8

(6) $\frac{x - 13}{6}$

(7) $\frac{3}{4}$

(8) $\frac{-8x + 17}{12}$

(9) $\frac{-2x - 11}{6}$

(10) $\frac{11x + 3}{20}$

Alternative Answer

$\left[-\frac{8x - 17}{12} \right]$

$\left[-\frac{2x + 11}{6} \right]$

at Plum Tree Park School! Since your child is
leadership roles, fun
for grade

H6-10

9

(1) $\frac{x - 5}{6}$

(2) $\frac{2x - 11}{6}$

(3) $\frac{x - 2}{3}$

(4) $\frac{-19x - 18}{15} \left[-\frac{19x + 18}{15} \right]$

(5) $\frac{x - y}{3}$

10

(1) $7x - 13$

(2) $4x - 5$

(3) $11x + 5$

(4) $7x + 16$

(5) $13x - 16y$

9

(6) $\frac{-2x - 3}{9} \left[-\frac{2x + 3}{9} \right]$

(7) $\frac{x - 1}{2}$

(8) $\frac{-x + 5}{4} \left[-\frac{x - 5}{4} \right]$

(9) $\frac{-7x + 10y}{9} \left[-\frac{7x - 10y}{9} \right]$

(10) $\frac{-x + 5}{3} \left[-\frac{x - 5}{3} \right]$

10

(6) $\frac{9x + 2}{6}$

(7) $\frac{-2x + 3y}{15} \left[-\frac{2x - 3y}{15} \right]$

(8) $\frac{-22x + 12}{15} \left[-\frac{22x - 12}{15} \right]$

(9) $5x + 35$

(10) $-2x - 15y$

H11-14 (4-6 min)

11

12

- 1.
- (1) -5
- (2) 13
- (3) -11
- (4) -3
- (5) -1
- (6) -9
- (7) 3
- (8) 9
- (9) 18
- (10) -9

- 1.
- (1) -6
- (2) -19
- (3) 14
- (4) -5
- (5) 0
- (6) -1
- (7) -1
- (8) -7

11

12

- 2.
- (1) 2
- (2) 10
- (3) 2
- (4) 2
- (5) $\frac{1}{12}$
- (6) 2
- (7) $\frac{1}{4}$
- (8) $-\frac{1}{4}$
- (9) $-\frac{1}{2}$

- 2.
- (1) $\frac{1}{6}$
- (2) $-\frac{5}{6}$
- (3) 0
- (4) 10
- (5) $\frac{1}{2}$
- (6) $-\frac{2}{3}$
- (7) $\frac{9}{10}$
- (8) $-\frac{2}{3}$

Grade 6 is a great year at Plum Tree Park School! Since your oldest cohort in the school...

H11-14

13

14

(1) $x = -2$
(Verification)
 $(-2) - 11$
 $(-2) - 11$

(3) $x = \frac{1}{2}$
(Verification)
LHS = -3
RHS = -3

(1) $x = \frac{9}{2}$
(Verification)
LHS = -24
RHS = -24

(3) $x = 2$
(Verification)
LHS = 0
RHS = 0

(2) $x = 1$
(Verification)
LHS = 3
RHS = 3

(4) $x = \frac{7}{4}$
(Verification)
LHS = 4
RHS = 4

(2) $x = 1$
(Verification)
LHS = -6
RHS = -6

(4) $x = \frac{3}{4}$
(Verification)
LHS = $-\frac{7}{4}$
RHS = $-\frac{7}{4}$

13

14

(5) $x = 4$
(Verification)
LHS = $\frac{10}{3}$
RHS = $\frac{10}{3}$

(7) $x = 18$
(Verification)
LHS = 5
RHS = 5

(5) $x = 8$
(6) $x = 3$

(6) $x = -4$
(Verification)
LHS = $-\frac{11}{6}$
RHS = $-\frac{11}{6}$

(7) $x = -20$
(8) $x = \frac{11}{7}$

15	16	17
(1) $x = 10$	(1) $x = -12$	(1) $x = 9$
(2) $x = 20$	(2) $x = 12$	(2) $x = 2$
(3) $x = -3$	(3) $x = 7$	(3) $x = -\frac{3}{5}$
(4) $x = 2$	(4) $x = 2$	(4) $x = 0$
(5) $x = \frac{2}{3}$		
15	16	17
(6) $x = -\frac{5}{2}$	(5) $x = 0$	(5) $x = -24$
(7) $x = 7$		
(8) $x = 2$	(6) $x = -8$	(6) $x = -\frac{1}{24}$
(9) $x = 0$		
(10) $x = \frac{9}{4}$	(7) $x = 2$	(7) $x = 2$

18	19	20
(1) $\begin{matrix} \boxed{3} & \boxed{1} \\ \boxed{3} & \boxed{5} \\ x = \frac{5}{3} \end{matrix}$	(1) $x = 1$	(1) $x = 9$
(2) $x = -19$	(2) $x = -16$	(2) $x = 17$
(3) $\begin{matrix} \boxed{3} \\ \boxed{3} & \boxed{9} \\ \boxed{7} & \boxed{7} \\ x = 1 \end{matrix}$	(3) $y = -5$	(3) $x = 1$
(4) $x = 4$	(4) $y = 16$	(4) $x = \frac{5}{2}$
18	19	20
(5) $x = -12$	(5) $x = 16$	(5) $y = \frac{6}{5}$
(6) $x = \frac{1}{12}$	(6) $x = 23$	(6) $y = 2$
(7) $x = 4$	(7) $y = 10$	(7) $t = -11$

H21-24 (5-8 min)

21a

Ex.

$$(1) \begin{cases} 7x + 2y = 20 \dots \textcircled{1} \\ 5x + 2y = 16 \dots \textcircled{2} \end{cases}$$

[Sol]

① - ②

$$\begin{array}{r} 7x + 2y = 20 \\ -) 5x + 2y = 16 \\ \hline 2x = 4 \\ x = 2 \end{array}$$

Substituting $x = 2$ into ①,

$$\begin{aligned} 14 + 2y &= 20 \\ 2y &= 6 \\ y &= 3 \end{aligned}$$

$$\begin{cases} x = 2 \\ y = 3 \end{cases}$$

(Verification)

Substituting $x = 2$ and $y = 3$ into ① and ②,

$$\begin{aligned} \textcircled{1} \quad \begin{cases} \text{LHS} &= 7x + 2y \\ &= 7 \times 2 + 2 \times 3 = 20 \\ \text{RHS} &= 20 \end{cases} \\ \textcircled{2} \quad \begin{cases} \text{LHS} &= 5x + 2y \\ &= 5 \times 2 + 2 \times 3 = 16 \\ \text{RHS} &= 16 \end{cases} \end{aligned}$$

21b

$$(2) \begin{cases} x = 3 \\ y = 2 \end{cases}$$

(Verification)

Substituting $x = 3$ and $y = 2$ into ① and ②,

$$\begin{aligned} \textcircled{1} \quad \begin{cases} \text{LHS} &= 8 \times 3 + 3 \times 2 = 30 \\ \text{RHS} &= 30 \end{cases} \\ \textcircled{2} \quad \begin{cases} \text{LHS} &= 5 \times 3 + 3 \times 2 = 21 \\ \text{RHS} &= 21 \end{cases} \end{aligned}$$

$$(3) \begin{cases} x = 2 \\ y = -1 \end{cases}$$

(Verification)

Substituting $x = 2$ and $y = -1$ into ① and ②,

$$\begin{aligned} \textcircled{1} \quad \begin{cases} \text{LHS} &= 9 \times 2 + 2 \times (-1) = 16 \\ \text{RHS} &= 16 \end{cases} \\ \textcircled{2} \quad \begin{cases} \text{LHS} &= 5 \times 2 + 2 \times (-1) = 8 \\ \text{RHS} &= 8 \end{cases} \end{aligned}$$

H21-24

22

23

24

$$\begin{aligned} (1) \quad & \begin{cases} 2 \\ 4 \end{cases} \\ & \begin{cases} 9 \\ 3 \end{cases} \begin{cases} x = 2 \\ y = 3 \end{cases} \\ (2) \quad & \begin{cases} x = 3 \\ y = -2 \end{cases} \\ (3) \quad & \begin{cases} x = -1 \\ y = 2 \end{cases} \\ (4) \quad & \begin{cases} x = 1 \\ y = 2 \end{cases} \end{aligned}$$

$$\begin{aligned} (1) \quad & \begin{cases} 4 \\ x = 4 \\ y = 3 \end{cases} \\ (2) \quad & \begin{cases} x = 3 \\ y = -2 \end{cases} \\ (3) \quad & \begin{cases} x = 2 \\ y = 1 \end{cases} \\ (4) \quad & \begin{cases} x = 1 \\ y = -2 \end{cases} \end{aligned}$$

Ex.

$$\begin{aligned} (1) \quad & \begin{cases} x = 2 \\ y = 1 \end{cases} \\ (2) \quad & \begin{cases} x = 2 \\ y = 3 \end{cases} \\ (3) \quad & \begin{cases} x = 2 \\ y = 1 \end{cases} \end{aligned}$$

22

23

24

$$(5) \begin{cases} x = 1 \\ y = 2 \end{cases}$$

$$(6) \quad \begin{cases} 3 \\ 3 \end{cases} \begin{cases} x = 2 \\ y = 3 \end{cases}$$

$$(7) \begin{cases} x = 1 \\ y = -2 \end{cases}$$

$$(8) \begin{cases} x = 8 \\ y = 3 \end{cases}$$

$$(5) \begin{cases} x = 2 \\ y = 1 \end{cases}$$

$$(6) \begin{cases} x = -1 \\ y = 2 \end{cases}$$

$$(7) \begin{cases} x = -2 \\ y = 1 \end{cases}$$

$$(8) \begin{cases} x = 1 \\ y = -2 \end{cases}$$

$$(4) \begin{cases} x = -2 \\ y = 1 \end{cases}$$

$$(5) \begin{cases} x = -3 \\ y = 2 \end{cases}$$

$$(6) \begin{cases} x = -2 \\ y = 3 \end{cases}$$

$$(7) \begin{cases} x = 2 \\ y = 0 \end{cases}$$

25	26	27
(1) $\begin{cases} x = 10 \\ y = -12 \end{cases}$ (2) $\begin{cases} x = -2 \\ y = 6 \end{cases}$ (3) $\begin{cases} x = 4 \\ y = 3 \end{cases}$ (4) $\begin{cases} x = 4 \\ y = -3 \end{cases}$	(1) $\begin{cases} x = 3 \\ y = 1 \end{cases}$ (2) $\begin{cases} x = 1 \\ y = -2 \end{cases}$ (3) $\begin{cases} x = -3 \\ y = 4 \end{cases}$ (4) $\begin{cases} x = -2 \\ y = -3 \end{cases}$	(1) $\begin{cases} a = 2 \\ b = -5 \end{cases}$ (2) $\begin{cases} a = 1 \\ b = -2 \end{cases}$ (3) $\begin{cases} a = 3 \\ b = 1 \end{cases}$ (4) $\begin{cases} a = 2 \\ b = 1 \end{cases}$
25	26	27
(5) $\begin{cases} x = 2 \\ y = 3 \end{cases}$ (6) $\begin{cases} x = -3 \\ y = 2 \end{cases}$ (7) $\begin{cases} x = 3 \\ y = 1 \end{cases}$ (8) $\begin{cases} x = 2 \\ y = 4 \end{cases}$	(5) $\begin{cases} x = -1 \\ y = 2 \end{cases}$ (6) $\begin{cases} x = -1 \\ y = -2 \end{cases}$ (7) $\begin{cases} x = 2 \\ y = 1 \end{cases}$ (8) $\begin{cases} x = -3 \\ y = -2 \end{cases}$	(5) $\begin{cases} a = 4 \\ b = -2 \end{cases}$ (6) $\begin{cases} a = 2 \\ b = 3 \end{cases}$ (7) $\begin{cases} a = 3 \\ b = -2 \end{cases}$ (8) $\begin{cases} a = -4 \\ b = 3 \end{cases}$

28	29	30
(1) $\begin{cases} x = 2 \\ y = \frac{1}{2} \end{cases}$ (2) $\begin{cases} x = 5 \\ y = 4 \end{cases}$ (3) $\begin{cases} x = 1 \\ y = 2 \end{cases}$ (4) $\begin{cases} x = 1 \\ y = \frac{1}{3} \end{cases}$	(1) $\begin{cases} x = 7 \\ y = -3 \end{cases}$ (2) $\begin{cases} x = 11 \\ y = -3 \end{cases}$ (3) $\begin{cases} x = \frac{5}{2} \\ y = 2 \end{cases}$ (4) $\begin{cases} x = -4 \\ y = 3 \end{cases}$	(1) $\begin{cases} x = -2 \\ y = 3 \end{cases}$ (2) $\begin{cases} x = -2 \\ y = 3 \end{cases}$ (3) $\begin{cases} x = -2 \\ y = 3 \end{cases}$ (4) $\begin{cases} x = -2 \\ y = 3 \end{cases}$
28	29	30
(5) $\begin{cases} x = 2 \\ y = 1 \end{cases}$ (6) $\begin{cases} x = 1 \\ y = -2 \end{cases}$ (7) $\begin{cases} x = 2 \\ y = 1 \end{cases}$ (8) $\begin{cases} x = 2 \\ y = \frac{1}{3} \end{cases}$	(5) $\begin{cases} x = 12 \\ y = -4 \end{cases}$ (6) $\begin{cases} x = 3 \\ y = -2 \end{cases}$ (7) $\begin{cases} x = -7 \\ y = 6 \end{cases}$ (8) $\begin{cases} x = \frac{1}{2} \\ y = \frac{1}{3} \end{cases}$	(5) $\begin{cases} a = 2 \\ b = -3 \end{cases}$ (6) $\begin{cases} a = 2 \\ b = -\frac{1}{3} \end{cases}$ Consider this!

H31-35 (5-8 min)

31

Ex.

$$(1) \begin{cases} x = 2 \\ y = 3 \end{cases}$$

(Verification)

Substituting $x = 2$ and $y = 3$ into ① and ②,

$$\textcircled{1} \begin{cases} \text{LHS} = 2 \times 2 + 3 = 7 \\ \text{RHS} = 7 \end{cases}$$

$$\textcircled{2} \begin{cases} \text{LHS} = 7 \times 2 + 2 \times 3 = 20 \\ \text{RHS} = 20 \end{cases}$$

32

$$(1) \begin{cases} 6x + 2y = 10 \\ 5x = 15 \end{cases}$$

$$\begin{cases} x = 3 \\ y = -4 \end{cases}$$

$$(2) \begin{cases} x = 2 \\ y = -3 \end{cases}$$

$$(3) \begin{cases} x = 1 \\ y = -3 \end{cases}$$

$$(4) \begin{cases} x = 1 \\ y = 3 \end{cases}$$

33

$$(1) \begin{cases} x = 1 \\ y = 2 \end{cases}$$

$$(2) \begin{cases} x = 3 \\ y = -4 \end{cases}$$

$$(3) \begin{cases} x = 2 \\ y = 1 \end{cases}$$

$$(4) \begin{cases} x = 2 \\ y = 1 \end{cases}$$

31

$$(2) \begin{cases} x = 2 \\ y = 1 \end{cases}$$

$$(3) \begin{cases} x = 2 \\ y = 1 \end{cases}$$

$$(4) \begin{cases} x = 3 \\ y = 2 \end{cases}$$

$$(5) \begin{cases} x = 1 \\ y = 3 \end{cases}$$

32

$$(5) \begin{cases} x = 4 \\ y = -3 \end{cases}$$

$$(6) \begin{cases} x = 3 \\ y = 7 \end{cases}$$

$$(7) \begin{cases} x = 5 \\ y = 3 \end{cases}$$

$$(8) \begin{cases} x = 3 \\ y = 1 \end{cases}$$

33

$$(5) \begin{cases} x = 2 \\ y = 1 \end{cases}$$

$$(6) \begin{cases} x = 3 \\ y = 2 \end{cases}$$

$$(7) \begin{cases} x = 1 \\ y = 2 \end{cases}$$

$$(8) \begin{cases} x = 1 \\ y = 2 \end{cases}$$

leadership roles, fun and challenging curriculum topics, and special for

H31-35

34

$$(1) \begin{cases} x = 3 \\ y = 2 \end{cases}$$

$$(2) \begin{cases} x = 1 \\ y = -3 \end{cases}$$

$$(3) \begin{cases} x = 2 \\ y = 3 \end{cases}$$

$$(4) \begin{cases} x = -3 \\ y = 2 \end{cases}$$

35

Ex.

$$(1) \begin{cases} x = -2 \\ y = 5 \end{cases}$$

$$(2) \begin{cases} x = 3 \\ y = 2 \end{cases}$$

$$(3) \begin{cases} x = -1 \\ y = 3 \end{cases}$$

34

$$(5) \begin{cases} x = 2 \\ y = -4 \end{cases}$$

$$(6) \begin{cases} x = -4 \\ y = -2 \end{cases}$$

$$(7) \begin{cases} x = 6 \\ y = 5 \end{cases}$$

35

$$(4) \begin{cases} x = 2 \\ y = 3 \end{cases}$$

$$(5) \begin{cases} x = -3 \\ y = 8 \end{cases}$$

$$(6) \begin{cases} x = 4 \\ y = 2 \end{cases}$$

$$(7) \begin{cases} x = 4 \\ y = -2 \end{cases}$$

36

$$(1) \begin{cases} x = 3 \\ y = -1 \end{cases}$$

$$(2) \begin{cases} x = 1 \\ y = 2 \end{cases}$$

$$(3) \begin{cases} x = 3 \\ y = -4 \end{cases}$$

$$(4) \begin{cases} x = -1 \\ y = 4 \end{cases}$$

37

$$(1) \begin{cases} x = 4 \\ y = 6 \end{cases}$$

$$(2) \begin{cases} x = 2 \\ y = -3 \end{cases}$$

$$(3) \begin{cases} x = -1 \\ y = 2 \end{cases}$$

$$(4) \begin{cases} x = -4 \\ y = -3 \end{cases}$$

38

$$(1) \begin{cases} x = 3 \\ y = 4 \end{cases}$$

$$(2) \begin{cases} x = 6 \\ y = 10 \end{cases}$$

$$(3) \begin{cases} x = 2 \\ y = 0 \end{cases}$$

$$(4) \begin{cases} x = 0 \\ y = \frac{3}{7} \end{cases}$$

36

$$(5) \begin{cases} x = 2 \\ y = 3 \end{cases}$$

$$(6) \begin{cases} x = 2 \\ y = -1 \end{cases}$$

$$(7) \begin{cases} x = 3 \\ y = -2 \end{cases}$$

37

$$(5) \begin{cases} x = 1 \\ y = 2 \end{cases}$$

$$(6) \begin{cases} x = -2 \\ y = 3 \end{cases}$$

$$(7) \begin{cases} x = 8 \\ y = 6 \end{cases}$$

38

$$(5) \begin{cases} x = 6 \\ y = -2 \end{cases}$$

$$(6) \begin{cases} x = 1100 \\ y = 1900 \end{cases}$$

$$(7) \begin{cases} x = 2 \\ y = 3 \end{cases}$$

39

$$(1) \begin{cases} x = 7 \\ y = 9 \end{cases}$$

$$(2) \begin{cases} x = 6 \\ y = -10 \end{cases}$$

$$(3) \begin{cases} x = 2 \\ y = 0 \end{cases}$$

$$(4) \begin{cases} x = 3 \\ y = -4 \end{cases}$$

39

$$(5) \begin{cases} x = 6 \\ y = 2 \end{cases}$$

$$(6) \begin{cases} x = -1100 \\ y = 1900 \end{cases}$$

$$(7) \begin{cases} x = 0 \\ y = 0 \end{cases}$$

40

$$(1) \begin{cases} x = 3 \\ y = 2 \end{cases}$$

$$(2) \begin{cases} x = -2 \\ y = 3 \end{cases}$$

$$(3) \begin{cases} x = 2 \\ y = -4 \end{cases}$$

$$(4) \begin{cases} x = -8 \\ y = -16 \end{cases}$$

40

$$(5) \begin{cases} x = 6 \\ y = -3 \end{cases}$$

$$(6) \begin{cases} x = 2 \\ y = -3 \end{cases}$$

$$(7) \begin{cases} x = 3 \\ y = -2 \end{cases}$$

H41-45 (5-8 min)

41

Ex.

$$(1) \begin{cases} x = -3 \\ y = 8 \end{cases}$$

$$(2) \begin{cases} x = 3 \\ y = 5 \end{cases}$$

42

$$(1) \begin{cases} x = 2 \\ y = 5 \end{cases}$$

$$(2) \begin{cases} x = 1 \\ y = -2 \end{cases}$$

$$(3) \begin{cases} x = 4 \\ y = 5 \end{cases}$$

$$(4) \begin{cases} x = 1 \\ y = -2 \end{cases}$$

43

$$(1) \begin{cases} x = 6 \\ y = -2 \end{cases}$$

$$(2) \begin{cases} x = 5 \\ y = -13 \end{cases}$$

$$(3) \begin{cases} x = -3 \\ y = -5 \end{cases}$$

41

$$(3) \begin{cases} x = -2 \\ y = 3 \end{cases}$$

$$(4) \begin{cases} x = -6 \\ y = -4 \end{cases}$$

$$(5) \begin{cases} x = 4 \\ y = -3 \end{cases}$$

$$(6) \begin{cases} x = 4 \\ y = 5 \end{cases}$$

42

$$(4) \begin{cases} x = 2 \\ y = 6 \end{cases}$$

$$(5) \begin{cases} x = -4 \\ y = 5 \end{cases}$$

$$(6) \begin{cases} x = 1 \\ y = 2 \end{cases}$$

43

$$(4) \begin{cases} x = 7 \\ y = -3 \end{cases}$$

$$(5) \begin{cases} x = 2 \\ y = \frac{1}{2} \end{cases}$$

$$(6) \begin{cases} x = \frac{3}{2} \\ y = -\frac{1}{2} \end{cases}$$

H41-45

44

Ex.

$$(1) \begin{cases} x = 5 \\ y = 2 \end{cases}$$

45

$$(1) \begin{cases} x = \frac{1}{5} \\ y = \frac{1}{2} \end{cases}$$

$$(2) \begin{cases} x = \frac{1}{10} \\ y = \frac{1}{2} \end{cases}$$

44

$$(2) \begin{cases} x = 4 \\ y = -3 \end{cases}$$

$$(3) \begin{cases} x = 8 \\ y = 2 \end{cases}$$

45

$$(3) \begin{cases} x = \frac{3}{5} \\ y = \frac{1}{4} \end{cases}$$

$$(4) \begin{cases} x = \frac{1}{2} \\ y = -\frac{2}{5} \end{cases}$$

46

$$(1) \begin{cases} x = 1 \\ y = -1 \end{cases}$$

$$(2) \begin{cases} x = 4 \\ y = 1 \end{cases}$$

$$(3) \begin{cases} x = 4 \\ y = 2 \end{cases}$$

$$(4) \begin{cases} x = 1 \\ y = 3 \end{cases}$$

46

$$(5) \begin{cases} x = 6 \\ y = -18 \end{cases}$$

$$(6) \begin{cases} x = 7 \\ y = -4 \end{cases}$$

$$(7) \begin{cases} x = 6 \\ y = 7 \end{cases}$$

47

$$(1) \begin{cases} x = -3 \\ y = 4 \end{cases}$$

$$(2) \begin{cases} x = 5 \\ y = 6 \end{cases}$$

$$(3) \begin{cases} x = 4 \\ y = 3 \end{cases}$$

47

$$(4) \begin{cases} x = -3 \\ y = -6 \end{cases}$$

$$(5) \begin{cases} x = -1 \\ y = 3 \end{cases}$$

$$(4) \begin{cases} x = 3 \\ y = -2 \end{cases}$$

48

$$\text{Ex. } (1) \begin{cases} x = 5 \\ y = -2 \end{cases}$$

48

$$(2) \begin{cases} x = 4 \\ y = 1 \end{cases}$$

$$(3) \begin{cases} x = 4 \\ y = -9 \end{cases}$$

H46-50

49

$$(1) \begin{cases} x = 1 \\ y = 2 \end{cases}$$

$$(2) \begin{cases} x = 1 \\ y = -2 \end{cases}$$

$$(3) \begin{cases} x = 5 \\ y = 24 \end{cases}$$

49

$$(4) \begin{cases} x = 6 \\ y = 2 \end{cases}$$

$$(5) \begin{cases} x = 2 \\ y = 1 \end{cases}$$

50

$$(1) \begin{cases} x = 6 \\ y = 3 \end{cases}$$

$$(2) \begin{cases} x = 3 \\ y = -2 \end{cases}$$

$$(3) \begin{cases} x = 3 \\ y = 4 \end{cases}$$

$$(4) \begin{cases} x = -\frac{5}{3} \\ y = \frac{8}{3} \end{cases}$$

50

$$(5) \begin{cases} x = 3 \\ y = 4 \end{cases}$$

Consider this!

51	52	53
Ex. (1) $\begin{cases} x = -2 \\ y = -4 \end{cases}$ (Verification) Substituting $x = -2$ and $y = -4$ into ① and ②, ① $\begin{cases} \text{LHS} = \frac{-2-1}{3} = -1 \\ \text{RHS} = \frac{-4}{4} = -1 \end{cases}$ ② $\begin{cases} \text{LHS} = \frac{-2}{2} = -1 \\ \text{RHS} = -4 + 3 = -1 \end{cases}$	(1) $\begin{cases} x = \frac{23}{2} \\ y = 5 \end{cases}$ (2) $\begin{cases} x = -5 \\ y = -4 \end{cases}$	(1) $\begin{cases} x = 5 \\ y = 2 \end{cases}$ (2) $\begin{cases} x = 3 \\ y = 7 \end{cases}$
51	52	53
(2) $\begin{cases} x = 9 \\ y = 12 \end{cases}$ (3) $\begin{cases} x = -8 \\ y = -9 \end{cases}$	(3) $\begin{cases} x = \frac{23}{2} \\ y = -5 \end{cases}$ (4) $\begin{cases} x = 5 \\ y = -4 \end{cases}$	(3) $\begin{cases} x = -3 \\ y = -3 \end{cases}$ (4) $\begin{cases} x = 3 \\ y = 2 \end{cases}$

54	55
(1) $\begin{cases} 24 \\ x = -12 \\ y = -30 \end{cases}$ (2) $\begin{cases} x = 4 \\ y = 8 \end{cases}$	(1) $\begin{cases} 2y \\ 2y \\ x = 4 \\ y = 6 \end{cases}$ (2) $\begin{cases} x = -1 \\ y = -3 \end{cases}$
54	55
(3) $\begin{cases} x = -4 \\ y = 2 \end{cases}$ (4) $\begin{cases} x = -2 \\ y = 4 \end{cases}$	(3) $\begin{cases} x = 8 \\ y = 6 \end{cases}$ (4) $\begin{cases} x = 4 \\ y = 2 \end{cases}$

56

$$(1) \begin{cases} x = \frac{5}{7} \\ y = \frac{11}{7} \end{cases}$$

$$(2) \begin{cases} x = 4 \\ y = -3 \end{cases}$$

57

$$(1) \begin{cases} x = 3 \\ y = 2 \end{cases}$$

$$(2) \begin{cases} x = -3 \\ y = 6 \end{cases}$$

58

$$(1) \begin{cases} x = -1 \\ y = -2 \end{cases}$$

$$(2) \begin{cases} x = 2 \\ y = -\frac{1}{2} \end{cases}$$

H56-60

59

$$(1) \begin{cases} x = 2 \\ y = -\frac{1}{2} \end{cases}$$

$$(2) \begin{cases} x = 7 \\ y = 3 \end{cases}$$

60

$$(1) \begin{cases} x = 8 \\ y = -6 \end{cases}$$

$$(2) \begin{cases} x = -14 \\ y = -12 \end{cases}$$

56

$$(3) \begin{cases} x = -1 \\ y = 1 \end{cases}$$

$$(4) \begin{cases} x = -4 \\ y = 2 \end{cases}$$

57

$$(3) \begin{cases} x = \frac{1}{2} \\ y = \frac{1}{2} \end{cases}$$

$$(4) \begin{cases} x = 4 \\ y = 2 \end{cases}$$

58

$$(3) \begin{cases} x = \frac{1}{2} \\ y = -\frac{1}{2} \end{cases}$$

$$(4) \begin{cases} x = 4 \\ y = - \end{cases}$$

59

$$(3) \begin{cases} -1 \\ 11 \\ x = 2 \\ y = 1 \end{cases}$$

$$(4) \begin{cases} x = 2 \\ y = 3 \end{cases}$$

60

$$(3) \begin{cases} x = -6 \\ y = -9 \end{cases}$$

$$(4) \begin{cases} x = 7 \\ y = -3 \end{cases}$$

H61-65 (5-8 min)

Grade 6 is a great year at Plumville Middle School. As the oldest cohort in the school, there are many opportunities and special leadership roles, fun and challenging curriculum topics, and special projects to complete this year.

Ex.

(1)

[Sol]

Substituting ① into ②,
 $5x - (3x - 1) = 7$

$$\begin{cases} x = 3 \\ y = 8 \end{cases}$$

(Verification)

Substituting $x = 3$ and $y = 8$
 into ① and ②,

$$\textcircled{1} \begin{cases} \text{LHS} = 8 \\ \text{RHS} = 3 \times 3 - 1 = 8 \end{cases}$$

$$\textcircled{2} \begin{cases} \text{LHS} = 5 \times 3 - 8 = 7 \\ \text{RHS} = 7 \end{cases}$$

61

62

63

$$(1) \begin{cases} x = 3 \\ y = -6 \end{cases}$$

$$(2) \begin{cases} x = -3 \\ y = 3 \end{cases}$$

$$(3) \begin{cases} x = 4 \\ y = -6 \end{cases}$$

$$(4) \begin{cases} x = 1 \\ y = -5 \end{cases}$$

$$(1) \begin{cases} x = 2 \\ y = 3 \end{cases}$$

$$(2) \begin{cases} x = 2 \\ y = 6 \end{cases}$$

$$(3) \begin{cases} x = 3 \\ y = 2 \end{cases}$$

$$(4) \begin{cases} x = 2 \\ y = 2 \end{cases}$$

61

62

63

$$(2) \begin{cases} x = 3 \\ y = 7 \end{cases}$$

$$(3) \begin{cases} x = -1 \\ y = 2 \end{cases}$$

$$(4) \begin{cases} x = 4 \\ y = 3 \end{cases}$$

$$(5) \begin{cases} x = 2 \\ y = -2 \end{cases}$$

$$(5) \begin{cases} x = -1 \\ y = 2 \end{cases}$$

$$(6) \begin{cases} x = 4 \\ y = 4 \end{cases}$$

$$(7) \begin{cases} x = 3 \\ y = 9 \end{cases}$$

$$(8) \begin{cases} x = 4 \\ y = -3 \end{cases}$$

$$(5) \begin{cases} x = 2 \\ y = 6 \end{cases}$$

$$(6) \begin{cases} x = -1 \\ y = 2 \end{cases}$$

$$(7) \begin{cases} x = 2 \\ y = -1 \end{cases}$$

$$(8) \begin{cases} x = 2 \\ y = 3 \end{cases}$$

H61-65

64

65

$$(1) \begin{cases} x = 3 \\ y = -2 \end{cases}$$

$$(2) \begin{cases} x = 2 \\ y = -1 \end{cases}$$

$$(3) \begin{cases} x = -7 \\ y = -11 \end{cases}$$

$$(4) \begin{cases} x = 5 \\ y = 2 \end{cases}$$

$$(1) \begin{cases} x = 3 \\ y = 1 \end{cases}$$

$$(2) \begin{cases} x = -2 \\ y = 4 \end{cases}$$

$$(3) \begin{cases} x = -2 \\ y = -4 \end{cases}$$

$$(4) \begin{cases} x = 6 \\ y = 5 \end{cases}$$

*Check if students solve the equations using the substitution method.

64

65

$$(5) \begin{cases} x = -4 \\ y = 5 \end{cases}$$

$$(6) \begin{cases} x = 2 \\ y = 2 \end{cases}$$

$$(7) \begin{cases} x = -3 \\ y = 2 \end{cases}$$

$$(8) \begin{cases} x = 3 \\ y = 5 \end{cases}$$

$$(5) \begin{cases} x = 7 \\ y = 7 \end{cases}$$

$$\begin{cases} x = 2 \\ y = 1 \end{cases}$$

$$(6) \begin{cases} x = 4 \\ y = -2 \end{cases}$$

In H66b-68, check which method students use.
 [S] (substitution method) and [E] (elimination method)
 denote which method is more quickly for solving.

66	67	68
1. (1) $\begin{cases} x = 3 \\ y = 4 \end{cases}$ (2) <Elimination method> $2x + 8y = -6$ <Substitution method> $x = -4y - 3$ $\begin{cases} x = 5 \\ y = -2 \end{cases}$	(1) [S] $\begin{cases} x = 1 \\ y = -2 \end{cases}$ (2) $\begin{cases} x = 2 \\ y = 11 \end{cases}$ (3) [E] $\begin{cases} x = 3 \\ y = -4 \end{cases}$	(1) [S] $\begin{cases} x = 5 \\ y = 2 \end{cases}$ (2) $\begin{cases} x = 2 \\ y = -1 \end{cases}$ (3) [E] $\begin{cases} x = -3 \\ y = 4 \end{cases}$
66	67	68
2. (1) [S] $\begin{cases} x = 3 \\ y = -1 \end{cases}$ (2) [S] $\begin{cases} x = -4 \\ y = -1 \end{cases}$ (3) [E] $\begin{cases} x = \frac{1}{5} \\ y = \frac{2}{5} \end{cases}$	(4) $\begin{cases} x = 5 \\ y = 3 \end{cases}$ (5) $\begin{cases} x = -6 \\ y = 0 \end{cases}$ (6) [E] $\begin{cases} x = \frac{1}{5} \\ y = \frac{11}{5} \end{cases}$	(4) [S] $\begin{cases} x = 10 \\ y = -2 \end{cases}$ (5) [E] $\begin{cases} x = 5 \\ y = -2 \end{cases}$

69	70
(1) $\begin{cases} x = -2 \\ y = -5 \end{cases}$ (2) $\begin{cases} x = 5 \\ y = 4 \end{cases}$ (3) $\begin{cases} x = 3 \\ y = 4 \end{cases}$	(1) $\begin{cases} x = 4 \\ y = -3 \end{cases}$ (2) $\begin{cases} x = \frac{20}{11} \\ y = -\frac{3}{11} \end{cases}$ (3) $\begin{cases} x = 3 \\ y = -4 \end{cases}$
69	70
(4) $\begin{cases} x = 3 \\ y = 7 \end{cases}$ (5) $\begin{cases} x = 3 \\ y = 2 \end{cases}$	(4) $\begin{cases} x = 3 \\ y = 2 \end{cases}$ (5) $\begin{cases} x = 3 \\ y = -4 \end{cases}$

71

Ex.

(1)

[Sol]

$$\textcircled{2} - \textcircled{1} \quad y + 2z = 8 \quad \dots \textcircled{4}$$

$$\textcircled{3} - \textcircled{2} \quad y + 4z = 14 \quad \dots \textcircled{5}$$

$$\textcircled{5} - \textcircled{4} \quad 2z = 6$$

$$z = 3$$

Substituting $z = 3$ into $\textcircled{4}$,

$$y + 6 = 8$$

$$y = 2$$

Substituting $y = 2$ and $z = 3$ into $\textcircled{1}$,

$$x + 2 + 3 = 6$$

$$x = 1$$

$$\begin{cases} x = 1 \\ y = 2 \\ z = 3 \end{cases}$$

71

$$(2) \quad \begin{cases} x = 3 \\ y = 2 \\ z = -1 \end{cases}$$

$$(3) \quad \begin{cases} x = 4 \\ y = 3 \\ z = -2 \end{cases}$$

72

$$(1) \quad \begin{cases} 10 \\ 2 \end{cases}$$

$$2$$

$$\begin{cases} x = 7 \\ y = 2 \\ z = 4 \end{cases}$$

$$(2) \quad \begin{cases} x = 5 \\ y = -1 \\ z = -2 \end{cases}$$

72

$$(3) \quad \begin{cases} x = 1 \\ y = 2 \\ z = 3 \end{cases}$$

73

(1) (Form two equations without x .)

$$\begin{cases} x = 1 \\ y = 2 \\ z = -3 \end{cases}$$

(2) (Form two equations without y .)

$$\begin{cases} x = 3 \\ y = 2 \\ z = -1 \end{cases}$$

73

(3) (Form two equations without z .)

$$\begin{cases} x = -2 \\ y = 3 \\ z = 4 \end{cases}$$

74

$$(1) \quad \begin{cases} x = 2 \\ y = -3 \\ z = -4 \end{cases}$$

$$(2) \quad \begin{cases} x = -4 \\ y = -2 \\ z = 3 \end{cases}$$

74

$$(3) \quad \begin{cases} x = 1 \\ y = -2 \\ z = 4 \end{cases}$$

75

$$(1) \quad \begin{cases} x = -1 \\ y = 2 \\ z = -4 \end{cases}$$

$$(2) \quad \begin{cases} x = -2 \\ y = \frac{3}{2} \\ z = 4 \end{cases}$$

75

$$(3) \quad \begin{cases} x = 2 \\ y = -1 \\ z = -5 \end{cases}$$

76

(1)

[Sol]

$$\textcircled{1} \times 2 \quad 12x + \boxed{4}y + 6z = 84 \quad \dots \textcircled{4}$$

$$\textcircled{2} \times 3 \quad 15x - \boxed{9}y + 6z = 60 \quad \dots \textcircled{5}$$

$$\textcircled{4} - \textcircled{5} \quad -3x + \boxed{13}y = 24 \quad \dots \textcircled{6}$$

$$\textcircled{2} \times 2 \quad 10x - \boxed{6}y + 4z = 40 \quad \dots \textcircled{7}$$

$$\textcircled{3} + \textcircled{7} \quad 12x - \boxed{15}y = 15 \quad \dots \textcircled{8}$$

$$\textcircled{6} \times 4 \quad -12x + \boxed{52}y = 96 \quad \dots \textcircled{9}$$

$$\textcircled{8} + \textcircled{9} \quad \boxed{37}y = 111$$

$$y = \boxed{3}$$

$$\begin{cases} x = 5 \\ y = 3 \\ z = 2 \end{cases}$$

76

$$(2) \begin{cases} x = 3 \\ y = 2 \\ z = 1 \end{cases}$$

77

(1)

$$\begin{cases} x = 2 \\ y = 4 \\ z = -3 \end{cases}$$

77

(2)

$$\begin{cases} x = -1 \\ y = \frac{1}{2} \\ z = 3 \end{cases}$$

78

(1)

$$\begin{cases} x = 1 \\ y = -2 \\ z = 5 \end{cases}$$

(2)

$$\begin{cases} x = 1 \\ y = -4 \\ z = 3 \end{cases}$$

78

(3)

$$\begin{cases} x = -1 \\ y = 2 \\ z = 3 \end{cases}$$

79

(1)

$$\begin{cases} x = 9 \\ y = 11 \\ z = 8 \end{cases}$$

(2)

$$\begin{cases} x = 1 \\ y = 2 \\ z = -3 \end{cases}$$

79

80

(1)

$$\begin{cases} x = 5 \\ y = -4 \\ z = 2 \end{cases}$$

(2)

$$\begin{cases} x = -2 \\ y = 3 \\ z = 1 \end{cases}$$

80

(3)

$$\begin{cases} x = -4 \\ y = 3 \\ z = -2 \end{cases}$$

Default View

Show / Hide

Close

Reference Mode

H71a

KUMON

H 71

Sistema de Equações Lineares

H77a

KUMON

H 77

Sistema de Equações Lineares
com Três e Quatro Incógnitas 1

(50 pontos)

Resolva os sistemas abaixo.

$$(1) \begin{cases} 3x - 2y - 4z = 10 \\ 2x - 4y - z = -9 \\ 6x - 5y - 7z = 13 \end{cases} \rightarrow \begin{cases} 3x - 2y - 4z = 10 \\ 4(1) = -8x + 16y + 4z = +36 \\ -5x + 14y = 46 \end{cases}$$

$$\begin{aligned} (2) \times 7 &= 14x - 28y - 7z = -63 \\ -6x + 5y + 7z &= -13 \\ 8x - 23y &= -76 \quad (5) \quad 40x - 115y = -380 \\ -5x + 14y &= 46 \quad (8) \quad -40x + 112y = 368 \\ -5x + 56 &= 46 \\ -5x &= -56 + 46 \\ -5x &= -10 \\ x &= 2 \end{aligned}$$

$$\begin{aligned} 2 \cdot 2 - 4 \cdot 4 - z &= -9 \\ -z &= -9 + 12 \\ -z &= 3 \\ z &= -3 \end{aligned}$$

Default View

Show / Hide

Close

Reference Mode

H71a

KUMON

H 71

Sistema de Equações Lineares

H77b

$$\begin{cases} (1) & 2x + 4y + 3z = 9 \\ (2) & 3x - 2y + 5z = 11 \\ (3) & 5x - 6y + 7z = 13 \end{cases}$$

$$(2) \times 2 = 6x - 4y + 10z = 22 \quad (4)$$

$$(1) + (4) = 8x + 13z = 31 \quad (5)$$

$$(8) \times 2 = 8x + 16z = 40 \quad (9)$$

$$\begin{aligned} (9) - (5) &= 3z = 9 \\ z &= \frac{9}{3} \\ z &= 3 \end{aligned}$$

$$(2) \times 3 = 9x - 6y + 15z = 33 \quad (6)$$

$$(3) \times -1 = -5x + 6y - 7z = -13 \quad (7)$$

$$(6) + (7) = 4x + 8z = 20 \quad (8)$$

$$4x + 8 \cdot 3 = 20$$

$$4x = 20 - 24$$

$$x = -\frac{4}{4}$$

$$x = -1$$

$$2 \cdot -1 + 4y + 3 \cdot 3 = 9$$

$$-2 + 4y + 9 = 9$$

$$4y = 2$$

$$y = \frac{1}{2}$$

$$\begin{cases} x = -1 \\ y = \frac{1}{2} \\ z = 3 \end{cases}$$

H81-85 (6-10 min)

81

$$(1) \begin{cases} x = 7 \\ y = 2 \\ z = 4 \end{cases}$$

$$(2) \begin{cases} x = 5 \\ y = -1 \\ z = -2 \end{cases}$$

81

(3) Since equation ③ does not have y , first form an equation without y from equations ① and ②.

$$\begin{cases} x = 3 \\ y = 2 \\ z = 1 \end{cases}$$

82

$$(1) \begin{cases} x = 2 \\ y = -1 \\ z = 4 \end{cases}$$

$$(2) \begin{cases} x = -2 \\ y = \frac{3}{2} \\ z = 4 \end{cases}$$

82

$$(3) \begin{cases} x = -1 \\ y = 2 \\ z = -5 \end{cases}$$

H81-85

83

$$(1) \begin{cases} x = 2 \\ y = -3 \\ z = 4 \end{cases}$$

$$(2) \begin{cases} x = 2 \\ y = -4 \\ z = 5 \end{cases}$$

83

$$(3) \begin{cases} x = 1 \\ y = 2 \\ z = -3 \end{cases}$$

84

$$(1) \begin{cases} x = -4 \\ y = 3 \\ z = 5 \end{cases}$$

$$(2) \begin{cases} x = 2 \\ y = 5 \\ z = 3 \end{cases}$$

84

$$(3) \begin{cases} x = 5 \\ y = -3 \\ z = 2 \end{cases}$$

85

$$(1) \begin{cases} x = 6 \\ y = 4 \\ z = 2 \end{cases}$$

$$(2) \begin{cases} x = 6 \\ y = 2 \\ z = 2 \end{cases}$$

85

$$(3) \begin{cases} x = \frac{1}{2} \\ y = \frac{1}{3} \\ z = \frac{1}{6} \end{cases}$$

Consider this!

H86-88 (6-10 min)

86

$$(1) \begin{cases} x = 6 \\ y = 2 \\ z = 1 \end{cases}$$

$$(2) \begin{cases} x = 3 \\ y = 1 \\ z = 1 \end{cases}$$

86

$$(3) \begin{cases} x = 3 \\ y = 1 \\ z = -3 \end{cases}$$

87

$$(1) \begin{cases} x - z = -1 \\ x = 4 \\ y = 1 \\ z = 5 \end{cases}$$

$$(2) \begin{cases} 6 \\ 2 \\ 1 \\ x = 2 \\ y = 1 \\ z = 6 \end{cases}$$

87

$$(3) \begin{cases} x = 9 \\ y = -3 \\ z = -2 \end{cases}$$

H86-88

88a

$$(1) \begin{cases} x = 4 \\ y = 3 \\ z = 2 \\ w = 1 \end{cases}$$

[Reference]

(Form three equations without x .)

[Sol]

$$\begin{aligned} \textcircled{1} - \textcircled{2} & -y - 2z - 5w = -12 \dots \textcircled{5} \\ \textcircled{2} - \textcircled{3} & -y - z + w = -4 \dots \textcircled{6} \\ \textcircled{3} - \textcircled{4} & -y - 3z - 2w = -11 \dots \textcircled{7} \\ \textcircled{5} - \textcircled{6} & -z - 6w = -8 \dots \textcircled{8} \\ \textcircled{6} - \textcircled{7} & 2z + 3w = 7 \dots \textcircled{9} \\ \textcircled{8} \times 2 & -2z - 12w = -16 \dots \textcircled{10} \\ \textcircled{9} + \textcircled{10} & -9w = -9 \\ & w = 1 \end{aligned}$$

Substituting $w = 1$ into $\textcircled{8}$,

$$\begin{aligned} -z - 6 &= -8 \\ -z &= -2 \\ z &= 2 \end{aligned}$$

Substituting $z = 2$ and $w = 1$ into $\textcircled{6}$,

$$\begin{aligned} -y - 2 + 1 &= -4 \\ -y &= -3 \\ y &= 3 \end{aligned}$$

Substituting $y = 3$, $z = 2$ and $w = 1$ into $\textcircled{1}$,

$$\begin{aligned} x + 3 + 2 + 1 &= 10 \\ x &= 4 \end{aligned}$$

88b

$$(2) \begin{cases} x = 4 \\ y = 3 \\ z = -2 \\ w = 1 \end{cases}$$

[Reference] *If equation numbers $\textcircled{1}$ - $\textcircled{4}$ are assigned to the given equations.

(Form three equations without x .)

[Sol]

$$\begin{aligned} \textcircled{1} - \textcircled{2} & -2y + 3z - 4w = -16 \dots \textcircled{5} \\ \textcircled{2} - \textcircled{3} & -y + 3z - 2w = -11 \dots \textcircled{6} \\ \textcircled{3} - \textcircled{4} & 2y - 4z + w = 15 \dots \textcircled{7} \\ \textcircled{5} + \textcircled{7} & -z - 3w = -1 \dots \textcircled{8} \\ \textcircled{6} \times 2 & -2y + 6z - 4w = -22 \dots \textcircled{9} \\ \textcircled{7} + \textcircled{9} & 2z - 3w = -7 \dots \textcircled{10} \\ \textcircled{8} - \textcircled{10} & -3z = 6 \\ & z = -2 \end{aligned}$$

Substituting $z = -2$ into $\textcircled{8}$,

$$\begin{aligned} 2 - 3w &= -1 \\ -3w &= -3 \\ w &= 1 \end{aligned}$$

Substituting $z = -2$ and $w = 1$ into $\textcircled{6}$,

$$\begin{aligned} -y - 6 - 2 &= -11 \\ -y &= -3 \\ y &= 3 \end{aligned}$$

Substituting $y = 3$, $z = -2$ and $w = 1$ into $\textcircled{1}$,

$$\begin{aligned} x + 3 + 2 + 1 &= 10 \\ x &= 4 \end{aligned}$$

89a

1.

[Sol 1]

$$-x + y = 10 \quad \dots \textcircled{5}$$

$$-y + z = -6 \quad \dots \textcircled{6}$$

$$x = -3$$

$$y = 7$$

$$z = 1$$

$$w = 0$$

[Reference]

(Form three equations without w .)

[Sol 1]

$$\textcircled{2} - \textcircled{3} \quad -x + y = 10 \quad \dots \textcircled{5}$$

$$\textcircled{3} - \textcircled{4} \quad -y + z = -6 \quad \dots \textcircled{6}$$

$$\textcircled{1} + \textcircled{5} \quad 2y + z = 15 \quad \dots \textcircled{7}$$

$$\textcircled{6} - \textcircled{7} \quad -3y = -21$$

$$y = 7$$

Substituting $y = 7$ into $\textcircled{5}$,

$$-x + 7 = 10$$

$$-x = 3$$

$$x = -3$$

Substituting $y = 7$ into $\textcircled{6}$,

$$-7 + z = -6$$

$$z = 1$$

Substituting $y = 7$ and $z = 1$ into $\textcircled{2}$,

$$7 + 1 + w = 8$$

$$w = 0$$

[Sol 2]

$$3x + 3y + 3z + 3w = 15 \quad \dots \textcircled{5}$$

$$x + y + z + w = 5 \quad \dots \textcircled{6}$$

(Form $\textcircled{5}$ from $\textcircled{1} + \textcircled{2} + \textcircled{3} + \textcircled{4}$, then use $\textcircled{5} \div 3$ and $\textcircled{1}$, $\textcircled{2}$, $\textcircled{3}$ and $\textcircled{4}$.)

[Sol 2]

$$\textcircled{1} + \textcircled{2} + \textcircled{3} + \textcircled{4}$$

$$3x + 3y + 3z + 3w = 15 \quad \dots \textcircled{5}$$

$$\textcircled{5} \div 3$$

$$x + y + z + w = 5 \quad \dots \textcircled{6}$$

$$\textcircled{6} - \textcircled{1} \quad w = 0$$

$$\textcircled{6} - \textcircled{2} \quad x = -3$$

$$\textcircled{6} - \textcircled{3} \quad y = 7$$

$$\textcircled{6} - \textcircled{4} \quad z = 1$$

89b

90

$$2. \quad \begin{cases} x = 0 \\ y = -1 \\ z = 2 \\ w = 1 \end{cases}$$

[Reference]

*If equation numbers $\textcircled{1}$ - $\textcircled{4}$ are assigned to the given equations. (Form three equations without z .)

[Sol]

$$\textcircled{1} - \textcircled{2} \quad 2y - w = -3 \quad \dots \textcircled{5}$$

$$\textcircled{2} + \textcircled{3} \quad 4x + y + 3w = 2 \quad \dots \textcircled{6}$$

$$\textcircled{3} + \textcircled{4} \quad 5x + 3y - 2w = -5 \quad \dots \textcircled{7}$$

$$\textcircled{6} \times 5 \quad 20x + 5y + 15w = 10 \quad \dots \textcircled{8}$$

$$\textcircled{7} \times 4 \quad 20x + 12y - 8w = -20 \quad \dots \textcircled{9}$$

$$\textcircled{8} - \textcircled{9} \quad -7y + 23w = 30 \quad \dots \textcircled{10}$$

$$\textcircled{5} \times 23 \quad 46y - 23w = -69 \quad \dots \textcircled{11}$$

$$\textcircled{10} + \textcircled{11} \quad 39y = -39$$

$$y = -1$$

Substituting $y = -1$ into $\textcircled{5}$,

$$-2 - w = -3$$

$$-w = -1$$

$$w = 1$$

Substituting $y = -1$ and $w = 1$ into $\textcircled{6}$,

$$4x - 1 + 3 = 2$$

$$4x = 0$$

$$x = 0$$

Substituting $x = 0$, $y = -1$ and $w = 1$ into $\textcircled{1}$,

$$0 - 1 + z + 1 = 2$$

$$z = 2$$

$$(1) \quad \begin{cases} x = 3 \\ y = -4 \\ z = 2 \end{cases}$$

$$(2) \quad \begin{cases} x = 3 \\ y = 1 \\ z = -2 \end{cases}$$

90

$$(3) \quad \begin{cases} x = 2 \\ y = -3 \\ z = 4 \end{cases}$$

H91-94 (6-8 min)

91

Ex.

(1) $x = a - b$

Ex.

(5) $x = -a - b$

Ex.

(1) $x = 3a$

92

(5) $x = 3a - 3b$

(2) $x = b + a$

(6) $x = b + a$

(2) $x = -4a$

(6) $x = -4a + 4$

(3) $x = b - a$

(7) $x = -b - a$

(3) $x = 5a - 5b$

(7) $x = 5a - 5b$

(4) $x = a - b$

(8) $x = -a + b$

(4) $x = -6a - 6$

(8) $x = -6a + 6$

91

Ex.

(9) $x = \frac{a}{3}$

(13) $x = \frac{a - b}{3}$

Ex.

(9) $x = 2b + a$

Ex.

(12) $x = \frac{2a + b}{5}$

(10) $x = -\frac{a}{4}$

(14) $x = -\frac{a - 1}{4}$

(10) $x = -3 - a$

(13) $x = \frac{3b - a}{4}$

(11) $x = \frac{a - b}{5}$

(15) $x = \frac{a - b}{5}$

(11) $x = -4a + b$

(14) $x = -\frac{4a - b}{5}$

(12) $x = -\frac{a + 1}{6}$

(16) $x = -\frac{a - 1}{6}$

Welcome to Grade 6

Grade 6 is a great year

H91-94

93

(1) $x = -a + 1$

(5) $x = -2a + 1$

(1) $x = \frac{4}{3}$

(5) $x + \frac{1}{3} = \frac{3}{4}$

$x = \frac{5}{12}$

(2) $x = -a - 2$

(6) $x = \frac{4b + a}{3}$

(2) $4x = 6$

$x = \frac{3}{2}$

(6) $x + \frac{7}{6} = -\frac{1}{3}$

$x = -\frac{3}{2}$

(3) $x = -\frac{a + b}{3}$

(7) $x = \frac{a - 2}{2}$

Alternative Answer
 $\left[x = \frac{a}{2} - 1 \right]$

(3) $\frac{x}{3} = \frac{2}{5}$

$x = \frac{6}{5}$

(7) $x - \frac{1}{6} = \frac{1}{2}$

$x = \frac{2}{3}$

(8) $x = \frac{a + 3b}{3}$

$\left[x = \frac{a}{3} + b \right]$

(4) $\frac{x}{4} = \frac{5}{6}$

$x = \frac{10}{3}$

(8) $x - \frac{1}{3} = \frac{5}{12}$

$x = \frac{3}{4}$

(4) $x = 4a - 4$

93

Ex.

(1) $a = 1 + b$

(5) $b = 3a - 3c$

(9) $\boxed{5} + 2x = \boxed{13}$

$x = 4$

(2) $b = -1 + a$

(6) $c = a - \frac{b}{3}$

(10) $27 - 4x = 5x$

$x = 3$

(3) $a = \frac{b - 2}{3}$

(7) $a = 2c - 3b$

(11) $\boxed{3}x = x + \boxed{5}$

$x = \frac{5}{2}$

(4) $b = 2 + 3a$

(8) $b = \frac{2c - a}{3}$

(12) $3x + 5 = 5x - 7$

$x = 6$

H95-97 (6-8 min)

95

$$(1) \quad 3x = x + 10$$

$$x = 5$$

$$(2) \quad \frac{x}{3} = x - 8$$

$$x = 12$$

$$(3) \quad \frac{3}{5}x = x - 4$$

$$x = 10$$

$$(4) \quad \frac{2}{3}x - 5 = \frac{x}{4}$$

$$x = 12$$

95

$$(5) \quad 2(x - 5) = 6$$

$$x = 8$$

$$(6) \quad \frac{3}{4}(x + 2) = 9$$

$$x = 10$$

$$(7) \quad 3x + 5 = 26$$

$$x = 7$$

$$(8) \quad x + 28 = 3(x + 6)$$

$$x = 5$$

(In H95-100, check if students describe what x represents.)

96

Ex. (1) Let x be the number of bags.
 $160x = 1280$

Ans. 8 bags

$$(2) \quad 8x = 960$$

Ans. 120 g

96

$$(3) \quad 80 \times 5 + 140x = 1660$$

Ans. 9 bags

(4) Let x be the weight of one box of chocolates.

$$140 \times 7 + 6x = 1490$$

Ans. 85 g

(5) Let x be the weight of one box of chocolates.

$$7x = 1000 - 20$$

Ans. 140 g

H95-97

97

Ex. (1) Ans. $(x + 5)$ blue shirts

(2) Ans. $(x - 5)$ blue shirts

(3) fewer
Ans. $(x - 5)$ red shirts

(4) Ans. $(x + 5)$ red shirts

97

(5)

[Sol 1] The number of blue shirts is $(x + 3)$; therefore,
 $x + (x + 3) = 515$

[Sol 2] The number of red shirts is $(x - 3)$; therefore,
 $x + (x - 3) = 515$

Ans. 256 red shirts, 259 blue shirts

*Mark [Sol 1] and [Sol 2] separately.

H98-100 (6-8 min)

98

(1)

[Sol 1] $x + (x + 4) = 32$

[Sol 2] $x + (x - 4) = 32$

*Mark [Sol 1] and [Sol 2] separately.

Ans. 18 tomatoes, 14 onions

98

(2)

[Sol] Let x be the number of **onions**.

$$x + (x + 3) = 21$$

[Alternative Sol] Let x be the number of **tomatoes**.

$$x + (x - 3) = 21$$

Ans. 9 onions, 12 tomatoes

(3)

[Sol] Let x be the number of apple trees.

$$x + (x - 500) = 2000$$

[Alternative Sol] Let x be the number of orange trees.

$$x + (x + 500) = 2000$$

Ans. 1250 apple trees, 750 orange trees

H98-100

99

(1) City B $(500 + x)$
 $1000 - x = 500 + x$

Ans. 250 people

(2) Let x be the number of people in City A who moved to City B.
 $1000 - x = (600 + x) + 100$

Ans. 150 people

99

(3) The son will be $(12 + x)$ years old
 The father will be $(43 + x)$ years old
 $2(12 + x) = 43 + x$

Ans. 19 years

(4) Let x be the William's present age.
 $x + 24 = 3x$

Ans. 12 years old

100

(1) $5x + 15 = 8x - 3$

Ans. 6 children

(2) Let x be the number of people in this family.
 $9x = 6x + 18$

Ans. 6 people

100

(3) $\frac{x}{5} = \frac{x}{8} + 3$

Ans. 40 peaches

(4) Let x be the number of pencils in the box.

$$\frac{x}{40} = \frac{x}{60} + 5$$

Pencils in the box: 600 pencils;

Ans. Pencils each student will get: 15 pencils

(In H101-110, check if students describe what x and y represent.)

101

Ex.

$$(1) \begin{cases} x + y = 14 \\ 120x + 140y = 1800 \end{cases}$$

Ans. Salt: 8 bags; Sugar: 6 bags

102

$$(1) \begin{cases} 2x + 5y = 400 \\ 3x + 8y = 620 \end{cases}$$

Ans. Plate: 100 g; Spoon: 40 g

(2) Let x be the weight of one bag of almonds and y be the weight of one bag of peanuts.

$$\begin{cases} 2x + 7y = 760 \\ 4x + 5y = 980 \end{cases}$$

Ans. A bag of almonds: 170 g; A bag of peanuts: 60 g

101

(2) Let x be the number of 50g balls and y be the number of 120g balls.

$$\begin{cases} x + y = 20 \\ 50x + 120y = 1560 \end{cases}$$

Ans. 50g balls: 12 balls; 120g balls: 8 balls

102

$$(3) \begin{cases} 5x + 3y = 475 \\ 3x = 2y \end{cases}$$

Ans. Fork: 50 g; Spoon: 75 g

(4) Let x be the weight of one bag of almonds and y be the weight of one bag of peanuts.

$$\begin{cases} 4x + 3y = 750 \\ 3x + 5y = 14y \end{cases}$$

Ans. A bag of almonds: 150 g; A bag of peanuts: 50 g

Ans. 120g balls: 12 balls; 90g balls: 8 balls

104

$$(1) \begin{cases} x = y + 400 \\ x + 800 = 3(y - 800) \end{cases}$$

Ans. Town A: 2200 people; Town B: 1800 people

(2) Let x be the number of members in Team Red and y be the number of members in Team Blue.

$$\begin{cases} x = y + 5 \\ x + 15 = 2(y - 15) \end{cases}$$

Ans. Team Red: 55 members; Team Blue: 50 members

103

$$(1) \begin{cases} x + y = 1000 \\ x = y + 200 \end{cases}$$

Ans. School A: 600 students; School B: 400 students

(2) Let x be the number of tourists who visited the aquarium and y be the number of tourists who visited the zoo.

$$\begin{cases} x + y = 1800 \\ x = y - 400 \end{cases}$$

Ans. Aquarium: 700 tourists; Zoo: 1100 tourists

103

$$(3) \begin{cases} x + y = 1800 \\ x = 2y \end{cases}$$

Ans. School A: 1200 students; School B: 600 students

(4) Let x be the number of tourists who visited the aquarium and y be the number of tourists who visited the zoo.

$$\begin{cases} x + y = 2400 \\ x = \frac{1}{3}y \end{cases}$$

Ans. Aquarium: 600 tourists; Zoo: 1800 tourists

104

(3) Let x be the number of people in Town A and y be the number of people in Town B.

$$\begin{cases} x = y - 300 \\ x + 600 = 2(y - 600) \end{cases}$$

Ans. Town A: 1200 people; Town B: 1500 people

(4) Let x be the number of members in Team Red and y be the number of members in Team Blue.

$$\begin{cases} x = y - 4 \\ x - 7 = \frac{1}{3}(y + 7) \end{cases}$$

Ans. Team Red: 16 members; Team Blue: 20 members

105

$$(1) \begin{cases} 6x + y = 1620 \\ 2x + y = 660 \end{cases}$$

Ans. The weight of the box: 180 g

(2) The weight of the milk after it was drunk is $\frac{y}{2}$.

$$\begin{cases} x + y = 280 \\ x + \frac{y}{2} = 200 \end{cases}$$

Ans. The weight of the glass: 120 g

105

(3) Let x be the weight of the cup and y be the weight of the tea before it was drunk.

$$\begin{cases} x + y = 200 \\ x + \frac{y}{2} = 160 \end{cases}$$

Ans. The weight of the cup: 120 g

(4) The weight of the water after it was drunk is $\frac{2y}{3}$.

$$\begin{cases} x + y = 760 \\ x + \frac{2y}{3} = 640 \end{cases}$$

Ans. The weight of the bottle: 400 g

106

$$(1) \begin{cases} x + y = 300 \\ \frac{40}{100}x + \frac{20}{100}y = 84 \end{cases}$$

Ans. 120 men, 180 women

(2) Let x be the total number of men and y be the total number of women.

$$\begin{cases} x + y = 400 \\ \frac{60}{100}x + \frac{20}{100}y = 136 \end{cases}$$

Ans. 140 men, 260 women

106

(3) Let x be the total number of roses and y be the total number of tulips.

$$\begin{cases} x + y = 3000 \\ \frac{70}{100}x + \frac{60}{100}y = 2000 \end{cases}$$

Ans. 2000 roses, 1000 tulips

$$(4) \begin{cases} \frac{40}{100}x + \frac{20}{100}y = 1100 \\ \frac{60}{100}x = \frac{80}{100}y \end{cases}$$

Ans. 2000 roses, 1500 tulips

108

$$(1) \begin{cases} x + y = 9 \\ 10y + x = 2(10x + y) - 9 \end{cases}$$

Ans. 36

$$(1) \text{ [Sol 1]} \begin{cases} x + y = 480 \\ \frac{98}{100}x + \frac{110}{100}y = 498 \end{cases}$$

$$\text{[Sol 2]} \begin{cases} x + y = 480 \\ -\frac{2}{100}x + \frac{10}{100}y = 18 \end{cases}$$

Ans. 250 blue shirts, 230 green shirts

*Mark [Sol 1] and [Sol 2] separately.

107

(2) Let x be the number of blue shirts last year and y be the number of green shirts last year.

$$\text{[Sol 1]} \begin{cases} x + y = 500 \\ \frac{115}{100}x + \frac{95}{100}y = 523 \end{cases}$$

$$\text{[Sol 2]} \begin{cases} x + y = 500 \\ \frac{15}{100}x - \frac{5}{100}y = 23 \end{cases}$$

Ans. 240 blue shirts, 260 green shirts

*Students can use either [Sol 1] or [Sol 2].

108

(3) Let x be the tens digit and y be the ones digit.

$$\begin{cases} 3x = y + 1 \\ 10y + x = 2(10x + y) + 7 \end{cases}$$

Ans. 38

109

$$(1) \begin{cases} x + y = 60 \\ \frac{x}{36} + \frac{y}{4} = 3 \end{cases}$$

Ans. By car: 54 km; By walking: 6 km

- (2) Let x be the distance I rode a bike and y be the distance I walked.

$$\begin{cases} x + y = 14 \\ \frac{x}{9} + \frac{y}{3} = 2 \end{cases}$$

Ans. By bike: 12 km; By walking: 2 km

109

- (3) Let x be the distance my sister rode a bike and y be the distance she walked.

$$\begin{cases} x + y = 26 \\ \frac{x}{16} + \frac{y}{4} = 2 \end{cases}$$

Ans. By bike: 24 km; By walking: 2 km

- (4) 1 hour and a half is expressed as $1\frac{30}{60} = \frac{3}{2}$ (hours).

Let x be the distance my brother drove at 50 km/h and y be the distance he drove at 80 km/h.

$$\begin{cases} x + y = 90 \\ \frac{x}{50} + \frac{y}{80} = \frac{3}{2} \end{cases}$$

Ans. At 50 km/h: 50 km; At 80 km/h: 40 km

110

$$(1) \begin{cases} 30x + 80y = 190 \\ x + y = 3 \end{cases}$$

Ans. From A to B: 1 hour(s); From B to C: 2 hour(s)

- (2) Let x be the time taken on the way to B and y be the time taken on the way back from B.

$$\begin{cases} 40x = 30y \\ x + y = 7 \end{cases}$$

Ans. On the way to B: 3 hour(s); On the way back from B: 4 hour(s)

110

$$(3) \begin{cases} 3x + 2y = 270 \\ y = x + 35 \end{cases}$$

Ans. Street: 40 km/h; Highway: 75 km/h

- (4) Let x be the distance Jacob walked and y be the distance he ran.

$$\begin{cases} x + y = 1200 \\ \frac{x}{50} + \frac{y}{150} = 20 \end{cases}$$

Ans. By walking: 900 m; By running: 300 m

111

Ex.

- (1) $2ab$
- (2) $3ab$
- (3) $15ab$
- (4) $20ab^2$
- (5) $3abcxy$
- (6) $\frac{12}{5}xyz$
- (7) $\frac{1}{2}abc^2$
- (8) $a^2b^2c^2$

112

Ex.

- (1) $32a^2$
- (2) $-30x^2$
- (3) $-18y^2$
- (4) $12x^2$
- (5) $-5a^2$

Ex.

- (6) x^5
- (7) x^9
- (8) x^4
- (9) y^4
- (10) a^7

113

Ex.

- (1) $-12x^7$
- (2) $15a^6$
- (3) $-6a^5$
- (4) $2x^4$
- (5) $-6a^5$
- (6) $10a^7$
- (7) $-10x^4$
- (8) $-3x^3$
- (9) $4a^4$
- (10) $4a^7$

111

Ex.

- (9) $-6xy$
- (10) $-6xy$
- (11) $-6abx$
- (12) $30xy$
- (13) $40abxy$
- (14) $21abc$
- (15) $-\frac{8}{3}mxy$
- (16) $-\frac{1}{3}abc$
- (17) $-24xyz$

112

Ex.

- (11) 3
- (12) x^6
- (13) a^5
- (14) a^9
- (15) b^7
- (16) c^5
- (17) y^6
- (18) z^8
- (19) x^8
- (20) y^9

113

Ex.

- (11) $12ab^5$
- (12) $-18a^3b$
- (13) $\frac{5}{4}a^2b$
- (14) $-12x^8y^6$
- (15) $-18x^6y^4$
- (16) $6a^7b^4$
- (17) $-6a^2b^3$
- (18) $-24a^2x^2y$
- (19) $24a^9b^{10}$

115

Ex.

- (1) a^{15}
- (2) a^8b^2
- (3) $9a^4$
- (4) $16a^6b^2$
- (5) $27a^6$
- (6) $8a^6b^3c^9$
- (7) $a^{12}b^{16}c^4$
- (8) $81a^{12}b^8c^4$

114

- (1) $28x^3y$
- (2) $3x^2y$
- (3) $-12x^3y^2$
- (4) $-16x^5y$
- (5) $3a^4b^3x$
- (6) 0
- (7) $-\frac{5}{2}x^4y^5$
- (8) $12x^7y^6$
- (9) $3x^4y^5$

114

- (10) $-2x^9$
- (11) $-24x^9$
- (12) $-40a^3x^2$
- (13) $-30x^2y^2z^2$
- (14) $60a^2b^3c$
- (15) $60x^6y^8z^4$
- (16) $12x^5y^6$
- (17) $60a^3b^3$
- (18) $-\frac{8}{21}a^6x^5y^6$

115

Ex.

- (9) 12
- (10) $25x^4y^8$
- (11) $27x^9y^3z^6$
- (12) $\frac{1}{4}a^2b^4c^6$
- (13) $\frac{a^3b^9}{8}$
- (14) $\frac{8}{27}x^6y^3z^9$
- (15) $6x^{24}$
- (16) $64x^{24}$

*If students make a lot of mistakes, have them write the intermediate steps.

H116-120 (5-7 min)

116

117

118

119

120

(1) $8a^6$

(2) $2a^6$

(3) $5x^4y^6$

(4) $5a^2b^4c^6$

(5) $2a^3b^3c^6$

(6) $\boxed{3}\boxed{3}\boxed{6} 3x^4y^3z^6$

(7) $5x^9y^3z^9$

(8) $18x^8y^4$

Ex.

(1) $-8a^6b^9$

(2) $16a^8b^{12}$

(3) a^6b^2

(4) $-64x^3$

(5) $-27a^3c^9$

(6) $81a^8b^4$

(7) $-243b^5c^{10}$

(8) $64a^6b^{12}c^{18}$

(1) a^2b^4

(2) $-a^2b^4$

(3) $25x^4y^6$

(4) $-5x^4y^6$

(5) $16a^4b^8c^4$

(6) $-2a^4b^8c^4$

(7) $-27x^3y^6z^9$

(1) $2ab^6c^3$

(2) $-2x^2y^3z^6$

(3) $\frac{1}{2}a^4b^7$

(4) $-\frac{1}{4}a^5b^9$

(5) $-\frac{1}{6}ax^3y^2$

(6) $\frac{1}{12}ax^4y^3$

(7) $8x^3y^5z^2$

(1) $-12a^4b^6$

(2) $27x^3y^6z^9$

(3) $-\frac{8}{27}a^3b^6c^3$

(4) $64x^6$

(5) $64x^6$

(6) $3x^7y^7$

(7) $-3x^9y^3z^9$

116

117

118

119

120

(9) $2x^2y^4$

(10) $16x^3y^9$

(11) $25x^6y^6$

(12) $5x^4y^8$

(13) $\boxed{2}\boxed{3} 72a^5$

(14) $72a^{12}$

(15) x^6y^6

(16) $27x^9y^9$

(9) $-\frac{8}{27}a^6b^9$

(10) $\frac{16}{81}a^8b^{12}$

(11) $-\frac{1}{32}a^5b^{15}$

(12) $\frac{1}{16}a^4b^8$

(13) $\frac{1}{81}a^4b^{12}$

(14) $-\frac{1}{32}a^{10}x^{15}$

(15) $-\frac{27}{64}a^{12}b^9$

(16) $-\frac{32}{243}a^{10}b^5c^{15}$

(8) $\boxed{3}\boxed{6} -24a^4b^7$

(9) $-2ax^4y^3$

(10) $-\frac{2}{3}ab^5c^6$

(11) $-2a^2b^6$

(12) $24ab^3c^6$

(13) $\frac{16}{27}a^4b^6$

(14) $-3a^6b^8$

(8) $\frac{8}{9}a^2b^6c^6$

(9) $\frac{4}{3}a^2b^5c^4$

(10) $\boxed{4}\boxed{2}\boxed{3}\boxed{3} -64x^7y^5$

(11) $24x^4y^5z^6$

(12) $-2x^7y^8$

(13) $a^6b^3x^6$

(14) $-\frac{3}{64}x^7y^8$

(8) $32x^5y^{10}z^3$

(9) $-6a^{11}b^{13}$

(10) $20x^5y^3z^2$

(11) $4x^3y^8z^6$

(12) x^6y^{10}

(13) $-108a^5b^6c^6$

(14) $-\frac{3}{64}x^7y^8$

*If students make a lot of mistakes, have them write the intermediate steps.

H116-120

H121-125 (5-7 min)

121	122	123
Ex.	Ex.	
(1) a^3	(1) $2x^2$	(1) $4x$
(2) $\frac{1}{a^3}$	(2) 2	(2) $\frac{3x^2}{2y^3}$
(3) a^3	(3) $\frac{1}{2x^3}$	(3) $\frac{8a^2}{3b^2}$
(4) $\frac{1}{a^2}$	(4) $\frac{3}{4x^2}$	(4) $\frac{8a^6b^{12}}{3}$
(5) a^4	(5) $\frac{9x^4}{5}$	(5) $\frac{2}{ab^2}$
(6) $6a^2$	(6) 3x	(6) $\frac{2a^2}{b^2}$
(7) $\frac{1}{a}$		(7) $\frac{x^6y^{12}}{4}$

121	122	123
(8) a^4	Ex.	(8) $-\frac{5x}{9}$
(9) a^4	(7) $\frac{4b}{a^3}$	(9) $\frac{x}{5a}$
(10) $\frac{1}{a}$	(8) $\frac{6a^2c^2}{b^2}$	(10) $-4b^2$
(11) $\frac{1}{a^2}$	(9) $6a^4b^4$	(11) $-\frac{2x^2}{y^2}$
(12) 1	(10) $\frac{ac^2}{3}$	(12) $-\frac{24b}{a}$
(13) a^8	(11) $\frac{b}{9}$	(13) $\frac{20}{3y^9}$
(14) 1	(12) $\frac{4xy^2}{3}$	(14) $\frac{a^4}{72b^6}$

H121-125

124	125
Ex.	Ex.
(1) $\frac{7}{3a}$	(1) $2a^2 + 6ab$
(2) $\frac{a^3}{4}$	(2) $3a^2 - 12ab$
(3) $\frac{4ab^2}{5}$	(3) $-2a^2 + 6ab$
(4) $-\frac{3y^2}{2x}$	(4) $-3x^2 + 6xy - 15xz$
(5) $\frac{8a^2}{3b^2}$	(5) $8a^2b - 12ab^2 + 16ab$
(6) $-\frac{x^5}{24y^3}$	(6) $-12a^2 + 20ab$
	(7) $-12a^2b + 20ab^2$
	(8) $-12x^3y + 4x^2y^2 - 8xy^3$

124	125
(7) $a^5b^7 - \frac{8a}{b^2}$	(9) $-2a + 6b$
(8) $-\frac{3a^3b}{2}$	(10) $-3a^2b + 6ab^2$
(9) $\frac{10y^3}{x^3}$	(11) $20x^2 - 10xy$
(10) $-\frac{x^5y^4}{7}$	(12) $-6ab + 15a$
(11) $-9x^3y^4$	(13) $-15a^2 - 20ab + 10a$
	(14) $a^2 - 3ab + 2a$
	(15) $6x^2y + 9xy$
	(16) $12ab - 20b^2$
	(17) $2x^2 - 3xy + 4x$

126

Ex.

- (1) $5x^2 - 2x$
- (2) $-x^2 - 4x$
- (3) $x^2 + 8x$
- (4) $8x^2 - 9x$
- (5) $4x^2 + 5xy$
- (6) $3x^2 - 4xy$
- (7) $2x^2 - 3y^2$

127

Ex.

- (1) $3x - 4$
- (2) $2x - 3$
- (3) $3a - 5$
- (4) $a - 3$
- (5) $3a - 1$
- (6) $2x^2 - 1$
- (7) $4x^2 - 6x + 3$

128

Ex.

- (1) $a + c$
- (2) $a + b$
- (3) $a + 2$
- (4) $\boxed{a^2} \boxed{a} \boxed{a}$
- (5) $5x + 1$
- (6) $b - c + 1$
- (7) $3x^2 - x + 1$

126

127

128

- (8) $a^2 - b^2$
- (9) $a^2 - 2ab + b^2$
- (10) 0
- (11) $2a^3 + a^2$
- (12) $-xy$
- (13) $a^3 + b^3$

- (8) $-3a - 2$
- (9) $-2y + 3x$
Alternative Answer
 $[3x - 2y]$
- (10) $-3x - 2$
- (11) $3a - 5$
- (12) $2x - 3y$
- (13) $1 - 2ab^2$
- (14) $2x^2 - 4x + 1$
- (15) $2a - \frac{3}{2} + 3a^2$
 $[3a^2 + 2a - \frac{3}{2}]$

- (8) $\boxed{2}$
- (9) $1 + \frac{b}{a}$
- (10) $a + 2 + \frac{b}{a}$
- (11) $a + 1 + \frac{1}{a}$
- (12) $a - 1 + \frac{3}{a}$
- (13) $\frac{x^3}{3} - x + \frac{2}{x}$
- (14) $\frac{x}{2} - \frac{3}{2} - \frac{1}{x}$
- (15) $\frac{1}{2y} - \frac{1}{x} + \frac{y}{2x^2}$

130

- (1) $\frac{4}{3a^2}$
- (2) $\frac{3}{m}$
- (3) $\frac{3a^3b^2}{2c^4}$
- (4) $\frac{4y^2}{x}$
- (5) $-\frac{1}{2a^2b}$
- (6) $-\frac{3x^3}{2y^3}$
- (7) $-4x^4y^4$

129

- (1) $x^2 + x - 1$
- (2) $-x^2 - x + 1$
- (3) $-2a^2 + 4a - 3$
- (4) $-3x + 1$
- (5) $5 - 3a^3x^2$
- (6) $6x - 4y + 2$
- (7) $5x - 3xy + 1$

129

- (8) $a^2 + ab$
- (9) $4a - 3$
- (10) $-3x + 2y$
- (11) $-a^2 + 3a - 2$
- (12) $-3x^3 + 1$
- (13) $-2b + ab^2$
- (14) $2x^2 - 4xy^2$

130

- (8) $2a^2b - 4ab^2 + 6ab$
- (9) $-x^2 - 8x$
- (10) $-4x^2 - 3xy$
- (11) $3x^2 - 4x + 1$
- (12) $2x^2 - 3x - 1$
- (13) $2x - 1 + \frac{y}{x}$
- (14) $-a + 2c + 4b$
 $[-a + 4b + 2c]$
- (15) $-a^2 + 2a^2b^3$

H131-134 (5-7 min)

131

Ex.

- (1) $6ax + 4ay + 3bx + 2by$
- (2) $6ax + 4ay - 3bx - 2by$
- (3) $2ax + 3ay - 4bx - 6by$
- (4) $2ax - 3ay - 4bx + 6by$
- (5) $8a^2 + 6ax - 12ab - 9bx$
- (6) $8a^2 - 6ax + 12ab - 9bx$
- (7) $2a^2 - 6ax - ab + 3bx$

131

Ex.

- (8) $x^2 + 2x - 15$
- (9) $x^2 + 8x + 15$
- (10) $x^2 - 8x + 15$
- (11) $2x^2 + 13x + 15$
- (12) $2x^2 - 7x - 15$
- (13) $2x^2 - 13x + 15$
- (14) $2x^2 + 7x - 15$

132

- (1) $x^2 + 6x + 8$
- (2) $x^2 - 2x - 8$
- (3) $x^2 - 9$
- (4) $x^2 + 6x + 9$
- (5) $6x^2 - 13x - 5$
- (6) $6x^2 + 13x - 5$
- (7) $16x^2 - 49$
- (8) $16x^2 + 56x + 49$

132

- (9) 9
- (10) $2x^2 + xy - 10y^2$
- (11) $2x^2 - xy - 10y^2$
- (12) $2x^2 - 9xy + 10y^2$
- (13) $x^2 - 4y^2$
- (14) $4x^2 + 20xy + 25y^2$

H131-134

134

133

- (1) $3x^2 + 13xy + 12y^2$
- (2) $3x^2 - 5xy - 12y^2$
- (3) $3x^2 + 5xy - 12y^2$
- (4) $3x^2 - 13xy + 12y^2$
- (5) $x^2 - y^2$
- (6) $x^2 - 9y^2$
- (7) $9x^2 - 16y^2$

133

- (8) $9x^2 - y^2$
- (9) $4x^2 - 25y^2$
- (10) $x^2 - 16$
- (11) $4x^2 - 49$
- (12) $9x^2 - 4$
- (13) $16x^2 - 1$
- (14) $64x^2 - 81$

- (1) $x^2 + 6x + 9$

- (2) $x^2 + 12x + 36$

- (3) $4x^2 + 4x + 1$

- (4) $4x^2 + 20x + 25$

- (5) $9x^2 + 24x + 16$

- (6) $16x^2 + 24xy + 9y^2$

- (7) $36x^2 + 60xy + 25y^2$

134

- (8) $x^2 - 6x + 9$

- (9) $x^2 - 12x + 36$

- (10) $4x^2 - 4x + 1$

- (11) $4x^2 - 20x + 25$

- (12) $9x^2 - 24x + 16$

- (13) $16x^2 - 24xy + 9y^2$

- (14) $36x^2 - 60xy + 25y^2$

(In H135-140, check if students write answers in descending order of x .)

135

Ex.

(1) $x^3 + 2x^2 - 5x + 12$

(2) $x^3 + 7x^2 + 7x - 15$

(3) $2x^3 - 3x^2 + 4x + 3$

(4) $3x^3 - 5x^2 + 7x + 3$

(5) $4x^3 + 9x^2 + 14x + 3$

135

(6) $2x^3 - 2x + 12$

(7) $x^3 - x - 6$

(8) $2x^3 - x^2 + 9$

(9) $x^3 + 8$

(10) $3x^3 - 7x^2 - 14x + 10$

(11) $3x^3 - 4x^2 + 25$

(12) $3x^3 + 4x^2 - 25$

136

(1) $2x^3 - 15x^2 + 12x - 35$

(2) $4x^3 + 9x + 5$

(3) $2x^3 + x^2 - 9$

(4) $2x^3 - x^2 - 12x - 9$

(5) $2x^3 - 7x^2 + 9$

136

(6) $6x^3 - 19x^2 + 13x - 2$

(7) $8x^3 - 28x^2 + 48$

(8) $2x^3 - 2x - 12$

(9) $-9x^3 - 9x^2 + 25x + 25$

(10) $6x^4 + 12x^3 - 13x^2 - 20x + 5$

138

(1) $x^4 + 4x^3 + 10x^2 + 12x + 9$

(2) $x^4 + 4x^3 - 2x^2 - 12x + 9$

(3) $9x^4 + 12x^3 - 2x^2 - 4x + 1$

138

(4) $x^3 + 6x^2 + 11x + 6$

(5) $x^4 - 1$

(6) $x^3 + 6x^2 + 12x + 8$

137

Ex.

(1) $2x^4 + 7x^3 - 8x^2 + 29x - 30$

(2) $6x^4 - 13x^3 + 23x^2 - 13x + 5$

(3) $-4x^4 + 12x^3 - 9x^2 + 25$

137

(4) $6x^4 - 11x^3 - x^2 + 10x - 6$

(5) $2x^4 - 8x^3 + 8x^2 - 18$

(6) $3x^5 - 6x^4 - 20x^3 + 5x^2 + 12x - 4$

139

(1) $x^4 - 4x^2 + 12x - 9$

(2) $x^4 - 4x^3 - 2x^2 + 12x + 9$

(3) $8x^3 - 36x^2 + 54x - 27$

139

(4) $x^3 + y^3$

(5) $x^3 - y^3$

(6) $x^4 + x^2y^2 + y^4$

Consider this!

140

(1) $2x^3 - 5x^2 + 5x + 4$

(2) $2x^3 - 5x^2 - 7x + 12$

(3) $6x^3 - 17x^2 + 18$

(4) $8x^3 + 1$

(5) $4x^3 - 17x + 12$

140

(6) $2x^4 - x^3 - 8x^2 + x + 6$

(7) $x^3 - 6x^2 + 12x - 8$

(8) $x^4 - 2x^2y^2 + y^4$

142

Formula Ex.

(1) $x^2 + 10x + 25$

(2) $x^2 + 8x + 16$

(3) $x^2 + 12x + 36$

(4) $x^2 + 4x + 4$

(5) $x^2 + 2x + 1$

(6) 2

(7) $x^2 + 2ax + a^2$

142

Ex.

(8) $4a^2 + 12ab + 9b^2$

(9) $x^2 + 6xy + 9y^2$

(10) $4x^2 + 4xy + y^2$

(11) $4x^2 + 4x + 1$

(12) $4x^2 + 12x + 9$

(13) $4x^2 + 20x + 25$

(14) $9x^2 + 12x + 4$

(15) $9x^2 + 24x + 16$

141

(1) $ax + ay + bx + by$
Alternative Answer
 $[ax + bx + ay + by]$

(2) $x^2 + xy - 2y^2$

(3) $x^2 - x - 6$

(4) $3x^2 - 11x - 70$

(5) $2x^2 + 3x - 9$

(6) $x^3 - 4x^2 + x + 6$

(7) $x^3 - 4x^2 - 6x + 5$

(8) $2x^3 - 7x^2 + 12x - 9$

141

(9) $x^2 + bx + ax + ab$
 $[x^2 + ax + bx + ab]$

(10) $x^2 - bx + ax - ab$
 $[x^2 + ax - bx - ab]$

(11) $x^2 - y^2$

(12) $9x^2 - 4y^2$

(13) $9x^2 + 30x + 25$

(14) $4x^2 - 12xy + 9y^2$

(15) $x^2 + 2xy + y^2$

(16) $x^2 - 2xy + y^2$

143

Formula

- (1) $x^2 - 2xy + y^2$
 (2) $x^2 - 10x + 25$
 (3) $x^2 - 8x + 16$
 (4) $4x^2 - 12xy + 9y^2$
 (5) $4x^2 - 20x + 25$
 (6) $9x^2 - 6x + 1$
 (7) $(3x^2)^2 - 2 \cdot 3x^2 \cdot y^3 + (y^3)^2$
 $9x^4 - 6x^2y^3 + y^6$
 (8) $x^6 - 2x^3y^2 + y^4$

143

- (9) $x^2 - 8xy^2 + 16y^4$
 (10) $x^4 - 2x^2y + y^2$
 (11) $x^4 - 2x^3 + x^2$
 (12) $\frac{x^2}{9} - \frac{2xy}{15} + \frac{y^2}{25}$
 (13) $\frac{x^2}{9} - \frac{xy}{6} + \frac{y^2}{16}$
 (14) $x^2 - \frac{2xy}{3} + \frac{y^2}{9}$
 (15) $x^2 - x + \frac{1}{4}$
 (16) $x^2 - 2 + \frac{1}{x^2}$

144

Ex.

- (1) $x^2 - 6xy + 9y^2$
 (2) $4x^2 - 4xy + y^2$
 (3) $16x^2 - 24xy + 9y^2$
 (4) $x^4 - 2x^2y + y^2$
 (5) $9x^4 - 24x^2y^3 + 16y^6$
 (6) $\frac{x^2}{9} - \frac{xy}{6} + \frac{y^2}{16}$
 (7) $x^2 - \frac{2xy}{3} + \frac{y^2}{9}$
 (8) $9x^4 - 2x^2y^3 + \frac{1}{9}y^6$

144

- (9) $9x^2 - 6xy + y^2$
 (10) $9x^2 - 6xy + y^2$
 (11) 6
 (12) $4x^2 + 12xy + 9y^2$
 (13) $16x^6 + 24x^3y^2 + 9y^4$
 (14) $\frac{x^2}{4} + \frac{xy}{3} + \frac{y^2}{9}$
 (15) $9x^2 + x + \frac{1}{36}$

145

Ex.

- (1) $-18x^2 + 60x - 50$
 (2) $-48x^2 + 72xy - 27y^2$
 (3) $75x^2 - 60x + 12$
 (4) $-2x^6 - 12x^3y - 18y^2$
 (5) $36x^2 + 96x + 64$
 (6) $9x^2 - 36xy + 36y^2$
 (7) $4x^4 - 32x^2y^2 + 64y^4$

145

- (8) $-18x^2 + 48x - 32$
 (9) $-48x^4y^2 + 120x^3y^3 - 75x^2y^4$
 (10) $36x^2 - 180x + 225$
 (11) $9x^2 - 12xy + 4y^2$
 (12) $-\frac{2}{3}a^2 + 2ab - \frac{3}{2}b^2$
 (13) $\frac{1}{9}a^2 - \frac{1}{3}ab + \frac{1}{4}b^2$

146

Formula

- (1) $x^2 - y^2$
 (2) $x^2 - 4y^2$
 (3) $4x^2 - 9y^2$
 (4) $25x^2 - 36$
 (5) $x^6 - 16$
 (6) $x^2y^2 - 1$
 (7) $x^2 - \frac{4}{9}$
 (8) $x^2 - 4$

146

- (9) $9x^2 - 25$
 (10) $18x^2 - 50$
 (11) $48x^2 - 27$
 (12) $-3a^2 + 27x^2$
 (13) $-125x^2 + 5$
 (14) $-x^2y^2 + 4$
 (15) $\frac{2}{9}x^2 - \frac{8}{25}$
 (16) $\frac{8}{9}x^2 - \frac{9}{8}$

H147-150 (5-7 min)

147

Formula

- (1) $x^2 + 8x + 16$
- (2) $9x^2 + 30x + 25$
- (3) $9x^2 - 12xy + 4y^2$
- (4) $9x^2 - 1$
- (5) $x^2 - 16y^2$
- (6) $25x^2 - 4y^2$
- (7) $25x^2 + 20xy + 4y^2$

147

- (8) $18x^2 + 24x + 8$
- (9) $-2x^2 + 18$
- (10) $-4x^2 + 20xy - 25y^2$
- (11) $-3x^2 + 27y^2$
- (12) $2x^2 + 10x + 16$
- (13) $14x^2 - 6xy - 4y^2$
- (14) $-37y^2 + 4xy$
Alternative Answer
 $[4xy - 37y^2]$
- (15) $8x^2 - 16x - 9$

148

Formula Ex.

- (1) $x^2 + 8x + 15$
- (2) $x^2 + 2x - 15$
- (3) $x^2 - 2x - 15$
- (4) $x^2 - 8x + 15$
- (5) $x^2 + 9x + 14$
- (6) $x^2 + 2x - 24$
- (7) $x^2 - 5x - 24$
- (8) $x^2 - 14x + 48$

148

- (9) $2x^2 - 6x - 20$
- (10) $-3x^2 - 3x + 36$
- (11) $-x^2y^2 + 7xy - 10$
- (12) $2x^2 + 10xy - 100y^2$
- (13) $2x^2 - 42$
- (14) -16
- (15) $-2x + 1$
- (16) $6x$

H147-150

150

- (1) $x^2 + 6x + 9$
- (2) $x^2 - 6x + 9$
- (3) $x^2 - 9$
- (4) $x^2 + 3x - 28$
- (5) $12x^2 - 60x + 75$
- (6) $18x^2 + 60x + 50$
- (7) $2x^2 - 4x - 30$
- (8) $-20x^2 + 45$

150

- (9) $12x^2 - 7x - 10$
- (10) $6x^2 - 23x + 20$
- (11) $-30x^2 - 25x + 20$
- (12) $12xy$
- (13) $2x^2 - 5x + 31$
- (14) $-5x$
- (15) $-y^2$

149

Formula

- (1) 31
- (2) $6x^2 + 19x + 10$
- (3) $3x^2 - 13x - 30$
- (4) $6x^2 + 11x - 10$
- (5) $8x^2 + 2xy - 15y^2$
- (6) $15x^2 + x - 40$
- (7) $-3x^2 + 22x + 16$

149

- (8) $12x^2 - 23x + 10$
- (9) $-2x^2 + 7x + 30$
- (10) $3x^2 + 2xy - 8y^2$
- (11) $8x^2 - 26xy + 15y^2$
- (12) $24x^2 + 2x - 70$
- (13) $20x^2 - 52x + 24$
- (14) $-8x^2 - 2x + 21$
- (15) $-18x^2 - 21x + 60$

H151-154 (4-6 min)

151

Ex.

- (1) $a(y+z)$
- (2) $x(y+z)$
- (3) $a(x-y)$
- (4) $x(a-b)$
- (5) $2(2x-3y)$
- (6) $3(2x+y)$
- (7) $4(x-2)$

151

Ex.

- (8) $4x(x-3)$
- (9) $3x(2x-3)$
- (10) $xy(x-y)$
- (11) $6xy(xy+4)$
- (12) $x^2(ax+b)$
- (13) $x^5(ax^2+b)$
- (14) $3x^2(4x+3)$
- (15) $3ax^2(a+2)$

152

- (1) $2(x+2)$
- (2) $2(x+1)$
- (3) $3x(2x+1)$
- (4) $x^2(2x+1)$
- (5) $a(x-y-z)$
- (6) $3x(x-3y+4z)$
- (7) $xy(x+y+1)$
- (8) $x(x^2-x+1)$

152

Ex.

- (9) $-2a(x+3y)$
- (10) $-2x(x+4)$
- (11) $-4x(a+b)$
- (12) $-y(3x-y)$
- (13) $-5xy(x-2y)$
- (14) $-4x(2y+z)$
- (15) $-5x(x-3y+2z)$

H151-154

154

Ex.

- (1) $3(x+y)(2a+b)$
- (2) $3(x-y)(2a+3b)$
- (3) $4(x+y)(a-3b)$
- (4) $2(x+3)(2a+3)$
- (5) $3(x-3)(x-2)$
- (6) $3(x-3)(x+1)$
- (7) $2(x+3)(2x-1)$

154

Ex.

- (8) $4c(x+y)(2a+3b)$
- (9) $3x(x+y)(2a+3b)$
- (10) $4x(x+y)(2a+3b)$
- (11) $2a(x+y)(a+2b)$
- (12) $2a(x-y)(2a-3b)$
- (13) $x(x-2y)(4x+y)$
- (14) $2a(x-2)(3a-2)$

153

Ex.

- (1) $(x+2)(a+b)$
- (2) $(2x-y)(x+y)$
- (3) $(a+b)(x+3)$
- (4) $(x-2)(3x-5)$
- (5) $(x+y)(3a+2)$
- (6) $(x+y)(3a+1)$
- (7) $(2a-b)(x+1)$

153

- (8) $(a-b)(x+y)$
- (9) $(x-y)(a-b)$
- (10) $(x+y)(2a+b)$
- (11) $(a-b)(3x+2y)$
- (12) $(a-b)(3x+1)$
- (13) $(x-y)(4a-1)$
- (14) $(x+y)(1+5a)$
- (15) $(x-2y)(6y-5z)$

H155-158 (4-6 min)

155

- (1) $3x(x+y)(3a+4b)$
- (2) $3xy(x+y)(3a+4b)$
- (3) $3x(x+y)(3a^2+4b^2)$
- (4) $3x^2(x+y)(3a+4b)$
- (5) $3x(x+y)(3ax+4b)$
- (6) $3(x+y)(3ax^2+4b)$
- (7) $3(x+y)(3ax^2+4)$
- (8) $3(x+y)(3ax^2+1)$

155

- (9) $5xy(a-b)(2+xy)$
- (10) $5xy(a-b)(2y+x)$
- (11) $5xy(a-b)(2xy+1)$
- (12) $3x(x+1)(2x+y)$
- (13) $3x(x+1)(2x+1)$
- (14) $2(a+3)(2x+1)$
- (15) $x(x-y)(x-1)$
- (16) $x^2(x-y)(1-x)$

156

Formula **Ex.**

- (1) $(x+y)^2$
- (2) $(x+3y)^2$
- (3) $(x-2y)^2$
- (4) $(x+7y)^2$
- (5) $(x+4)^2$
- (6) $(x-5)^2$
- (7) $(x-6)^2$
- (8) $(x+10)^2$

156

Ex.

- (9) $(3x+2y)^2$
- (10) $(4x-5y)^2$
- (11) $(5x-6y)^2$
- (12) $(x+9)^2$
- (13) $(2x+3)^2$
- (14) $(2x-9)^2$
- (15) $(2x+1)^2$
- (16) $(4x-1)^2$

H155-158

158

Ex. $2a(3x+5y)^2$

(2) $-5ab(2x-a)^2$

(3) $x(x-5)^2$

(4) $a(x-y)^2$

(5) $3(x-3)^2$

(6) $-(x^2-2xy+y^2) = -(x-y)^2$

(7) $-(a-3x)^2$

158

(8) $4ab(3x+2y)^2$

(9) $2x(a+3b)^2$

(10) $a^3(x-y)^2$

(11) $-3(x+2y)^2$

(12) $5(x-4y)^2$

(13) $3a(2xy+5)^2$

(14) $-(x+y)^2$

(15) $-(2x-y)^2$

157

1. (1) $(2x+y)^2$

(2) $(x-1)^2$

(3) $(6x+5y)^2$

(4) $(5x-2y)^2$

(5) $(xy-6)^2$

(6) $(ax+3)^2$

(7) $(3x-1)^2$

(8) $\left(x+\frac{1}{3}\right)^2$

157

*If students don't write "non-factorable" for any problems, give the worksheet back to them without marking.

2.

(1) $(x+7)^2$

(2) $(x-8)^2$

(3) non-factorable

(4) $(x-9)^2$

(5) $(2x-3)^2$

(6) $(3x-5)^2$

(7) non-factorable

(8) $\left(3x+\frac{1}{2}\right)^2$

159

Ex.

160

- (1) $(x^2 + y^4)^2$
- (2) $(x^2 + 2y^3)^2$
- (3) $(x^2 + 6y^5)^2$
- (4) $(x^2 + y^2)^2$
- (5) $(5x^2 + 7y)^2$
- (6) $(3x^2 + 1)^2$
- (7) $-(3x^2 - 4)^2$

- (1) $x^2(x + 1)$
- (2) $12a(3x^2 + 5y^2 + 7z^2)$
- (3) $(2x - y)(x + y)$
- (4) $(a + 1)(3x + 1)$
- (5) $2(x + 3)(2a + 1)$
- (6) $3(x - 3)(a + 1)$
- (7) $3(a - 2)(x - 2)$
- (8) $x(a + b)(x - 1)$

159

160

- (8) $(x^2 - y^3)^2$
- (9) $(2x^2 + 3y^2)^2$
- (10) $2(x^3 + y^2)^2$
- (11) $-2(x^2 - 3y^2)^2$
- (12) $-5(2x^2 - y^2)^2$
- (13) $\boxed{4}$
- (14) $\boxed{6x} \quad \boxed{3}$
- (15) $\boxed{4xy} (2x + y)^2$
- (16) $\boxed{9} (x - 3)^2$

- (9) $(x + 2)^2$
- (10) $(x - 3)^2$
- (11) $(2x - y)^2$
- (12) $(2x - 7y)^2$
- (13) $(3x^3 - 5y^4)^2$
- (14) $2(x^2 + 3y^3)^2$
- (15) $-3a(x - 4y)^2$
- (16) $-(3x + 2y)^2$

162

Ex.

- (1) $(3x^2 + y)(3x^2 - y)$
- (2) $(4x^2 + 5y)(4x^2 - 5y)$
- (3) $(3xy + 1)(3xy - 1)$
- (4) $(3x^2y + 11)(3x^2y - 11)$
- (5) $(x^3 + y)(x^3 - y)$
- (6) $(x + 3y^3)(x - 3y^3)$
- (7) $(4x^3 + 5y^2)(4x^3 - 5y^2)$

161

Formula

- (1) $(x + y)(x - y)$
- (2) $(x + 2y)(x - 2y)$
- (3) $(x + 5)(x - 5)$
- (4) $(2x + 5)(2x - 5)$
- (5) $(3x + 5)(3x - 5)$
- (6) $(4x + 5y)(4x - 5y)$
- (7) $(xy + 4)(xy - 4)$
- (8) $(xy + 4a)(xy - 4a)$

161

162

- (9) $(x + 7)(x - 7)$
- (10) $(x + 9y)(x - 9y)$
- (11) $(3x + 5y)(3x - 5y)$
- (12) $(2x + 3)(2x - 3)$
- (13) $(2x + 7y)(2x - 7y)$
- (14) $(1 + 2x)(1 - 2x)$
- (15) $(xy + 2z)(xy - 2z)$
- (16) $(5xy + 7ab)(5xy - 7ab)$

- (8) $(2x + 3y^2)(2x - 3y^2)$
- (9) $(3x^2 + 4y)(3x^2 - 4y)$
- (10) $(3xy + 2z)(3xy - 2z)$
- (11) $(2x^3 + 5y^4)(2x^3 - 5y^4)$
- (12) $(3xy^2 + 4z^3)(3xy^2 - 4z^3)$
- (13) $(4x^2y + 5az^2)(4x^2y - 5az^2)$
- (14) $(7xy^2 + 11z)(7xy^2 - 11z)$
- (15) $(9x + 8yz)(9x - 8yz)$

163

Ex.

- (1) $a(x+3y)(x-3y)$
- (2) $3(2x+y)(2x-y)$
- (3) $a(x+7y)(x-7y)$
- (4) $2(x+5)(x-5)$
- (5) $3ax(y+3)(y-3)$
- (6) $y^2(3x+2)(3x-2)$
- (7) $x(xy+z)(xy-z)$

163

- (8) $3(x+5)(x-5)$
- (9) $2(x+6)(x-6)$
- (10) $3(xy+2z)(xy-2z)$
- (11) $3x(xy+2z)(xy-2z)$
- (12) $ax(x^2+y)(x^2-y)$
- (13) $2x(x^2+y)(x^2-y)$
- (14) $xy(x+y)(x-y)$
- (15) $xyz(x+y)(x-y)$
- (16) $xyz(xy+z)(xy-z)$

Mark correct even when the order of factors is reversed.
Ex: H164 (1) $(x+1)(x+2)$

164

Formula Ex.

- (1) $(x+2)(x+1)$
- (2) $(x+4)(x+2)$
- (3) $(x+5)(x+2)$
- (4) $(x-3)(x-1)$
- (5) $(x-5)(x-3)$
- (6) $(x-7)(x-2)$
- (7) $(x-6)(x-3)$

164

- (8) $(x-3)(x-2)$
- (9) $(x-4)(x-2)$
- (10) $(x-5)(x-2)$
- (11) $(x+5)(x+3)$
- (12) $(x+7)(x+2)$
- (13) $(x+6)(x+3)$
- (14) $(x-8)(x-2)$
- (15) $(x+8)(x+2)$

166

Formula Ex.

- (1) $(x+7)(x-2)$
- (2) $(x+8)(x-2)$
- (3) $(x+6)(x-4)$
- (4) $(x-6)(x+3)$
- (5) $(x-3)(x+1)$
- (6) $(x+3)(x-2)$
- (7) $(x-5)(x+4)$

165

- (8) $(x-7)(x+2)$
- (9) $(x-8)(x+2)$
- (10) $(x-6)(x+4)$
- (11) $(x+6)(x-3)$
- (12) $(x+3)(x-1)$
- (13) $(x-3)(x+2)$
- (14) $(x+5)(x-4)$
- (15) $(x+6)(x-5)$

- (1) $(x+2)(x+1)$
- (2) $(x-2)(x-1)$
- (3) $(x+2)(x-1)$
- (4) $(x-2)(x+1)$
- (5) $(x+4)(x+2)$
- (6) $(x-4)(x-2)$
- (7) $(x+4)(x-2)$
- (8) $(x-4)(x+2)$

166

- (9) $(x+6)(x+2)$
- (10) $(x-6)(x-2)$
- (11) $(x+6)(x-2)$
- (12) $(x-6)(x+2)$
- (13) $(x+4)(x+3)$
- (14) $(x-4)(x-3)$
- (15) $(x+4)(x-3)$
- (16) $(x-4)(x+3)$

H167-170 (5-7 min)

167

168

- (1) $(x+3)(x+1)$
- (2) $(x-7)(x-3)$
- (3) $(x+5)(x-2)$
- (4) $(x-9)(x+2)$
- (5) $(x+8)(x-7)$
- (6) $(x-9)(x-2)$
- (7) $(x-5)(x-4)$
- (8) $(x-12)(x+2)$

- (1) $(x+7)(x+4)$
- (2) $(x-7)(x+4)$
- (3) $(x+7)(x-4)$
- (4) $(x+28)(x+1)$
- (5) $(x-28)(x-1)$
- (6) $(x+28)(x-1)$
- (7) $(x-28)(x+1)$
- (8) $(x-9)(x+6)$

167

168

- (9) $(x-7)(x+3)$
- (10) $(x-8)(x+5)$
- (11) $(x-8)(x-3)$
- (12) $(x-6)(x-4)$
- (13) $(x-6)(x+5)$
- (14) $(x-12)(x-1)$
- (15) $(x+7)(x-6)$
- (16) $(x-17)(x+5)$

- (9) $(x+9)(x+4)$
- (10) $(x+6)^2$
- (11) $(x+12)(x+3)$
- (12) $(x-18)(x-2)$
- (13) $(x+8)(x-3)$
- (14) $(x+9)(x-6)$
- (15) $(x-12)(x+10)$
- (16) $(x+13)(x-12)$

H167-170

170

169

Ex.

- (1) $2(x+10)(x+4)$
- (2) $3(x-4)(x-1)$
- (3) $a(x-6)(x+2)$
- (4) $2(x+5)(x-2)$
- (5) $-2(x+2)(x-1)$
- (6) $-3a(x-4)(x+1)$
- (7) $-2(x-11)(x-2)$

- (1) $(2x+5y)(2x-5y)$
- (2) $(4x^3+7ay^2)(4x^3-7ay^2)$
- (3) $3ax(xy+3z)(xy-3z)$
- (4) $y^2(3x+4)(3x-4)$
- (5) $(x-5)(x-3)$
- (6) $(x-8)(x+3)$
- (7) $(x+9)(x-4)$
- (8) $(x+10)(x+3)$

169

170

- (8) $2(x-8)(x+5)$
- (9) $3(x-8)(x-3)$
- (10) $-2(x-6)(x+5)$
- (11) $2(x-6)(x+2)$
- (12) $2x(x+3)(x-1)$
- (13) $-3(x+6)(x-2)$
- (14) $-2(x-12)(x+1)$
- (15) $-(x+7)(x-4)$

- (9) $(x-4)^2$
- (10) $(x-16)(x+1)$
- (11) $(x+12)(x+3)$
- (12) $2(x-10)(x-4)$
- (13) $a(x+6)(x+2)$
- (14) $-3a(x+5)(x-2)$
- (15) $2x(x+2)(x-1)$
- (16) $-2(x-12)(x-1)$

H171-175 (5-7 min)

Mark correct even when the order of factors is reversed.
Ex: H171 2. (3) $(3x+7)(x+1)$

171	172	173
1. (1) 3	(1) $(x+1)(2x+5)$	(1) $(x+1)(3x+4)$
(2) 3	(2) $(x-1)(2x-5)$	(2) $(x-1)(3x-4)$
(3) 5	(3) $(x-1)(2x+5)$	(3) $(x+4)(3x-1)$
(4) 7	(4) $(x+1)(2x-5)$	(4) $(x-4)(3x+1)$
Ex.	(5) $(x+5)(2x+1)$	(5) $(x+2)(3x+2)$
2. (1) $(x+1)(3x+5)$	(6) $(x-5)(2x-1)$	(6) $(x-2)(3x-2)$
(2) $(x+5)(3x+1)$	(7) $(x-5)(2x+1)$	(7) $(x-2)(3x+2)$
(3) $(x+1)(3x+7)$	(8) $(x+5)(2x-1)$	(8) $(x+2)(3x-2)$
171	172	173
(4) $(x+3)(2x+1)$	(9) $(x+1)(5x+2)$	(9) $(x+1)(5x+4)$
(5) $(x+1)(2x+3)$	(10) $(x-1)(5x-2)$	(10) $(x+2)(5x+2)$
(6) $(x-1)(2x-3)$	(11) $(x-1)(5x+2)$	(11) $(x-2)(5x-2)$
(7) $(x-1)(2x+3)$	(12) $(x+1)(5x-2)$	(12) $(x+4)(5x+1)$
(8) $(x+1)(2x-3)$	(13) $(x+1)(5x+7)$	(13) $(x-4)(5x-1)$
(9) $(x-3)(2x+1)$	(14) $(x+1)(5x-7)$	(14) $(x-2)(5x+2)$
(10) $(x-3)(2x-1)$	(15) $(x-7)(5x-1)$	(15) $(x+2)(5x-2)$
	(16) $(x-7)(5x+1)$	(16) $(x+1)(5x-4)$

H171-175

174	175
(1) $(x+1)(5x+6)$	(1) $(x-1)(4x-3)$
(2) $(x+2)(5x+3)$	(2) $(x+3)(4x-1)$
(3) $(x+3)(5x+2)$	(3) $(x-3)(4x+1)$
(4) $(x+6)(5x+1)$	(4) $(2x+3)(2x+1)$
(5) $(x+2)(5x-3)$	(5) $(2x-3)(2x-1)$
(6) $(x-2)(5x+3)$	(6) $(2x+3)(2x-1)$
(7) $(x-6)(5x+1)$	(7) $(2x-3)(2x+1)$
(8) $(x-6)(5x-1)$	
174	175
(9) $(x-1)(5x-6)$	(8) $(x+1)(6x+5)$
(10) $(x-2)(5x-3)$	(9) $(x+5)(6x+1)$
(11) $(x-3)(5x-2)$	(10) $(2x-1)(3x+5)$
(12) $(x-3)(5x+2)$	(11) $(2x+5)(3x-1)$
(13) $(x+3)(5x-2)$	(12) $(x+5)(6x-1)$
(14) $(x-1)(5x+6)$	(13) $(2x+1)(3x+5)$
(15) $(x+1)(5x-6)$	(14) $(2x+1)(3x-5)$
(16) $(x+6)(5x-1)$	

H176-180 (5-7 min)

176

(1) $(2x+3)(3x+5)$

(2) $(2x-3)(3x-5)$

(3) $(2x-3)(3x+5)$

(4) $(2x+3)(3x-5)$

(5) $(2x-3)(3x+7)$

(6) $(2x+3)(3x-7)$

177

(1) $(x+1)(2x+7)$

(2) $(x-2)(2x-3)$

(3) $(x+2)(3x-4)$

(4) $(x-2)(5x+7)$

(5) $(x+2)(4x-5)$

(6) $(2x+3)(3x-4)$

(7) $(2x+3)(4x-7)$

178

(1) $(x-5)(2x+3)$

(2) $(x+2)(3x-5)$

(3) $(x-2)(5x+6)$

(4) $(x+3)(7x+4)$

(5) $(2x-5)(4x+7)$

(6) $(2x-3)(6x+5)$

(7) $(3x-2)(4x+7)$

176

(7) $(2x+3)(4x-5)$

(8) $(2x-3)(4x+5)$

(9) $(2x+5)(4x+3)$

(10) $(2x-5)(4x-3)$

(11) $(2x-5)(4x+3)$

(12) $(2x+5)(4x-3)$

177

(8) $(x-2)(2x+5)$

(9) $(x-3)(3x+2)$

(10) $(x-1)(4x+7)$

(11) $(x-2)(5x-4)$

(12) $(2x+5)(3x-4)$

(13) $(2x+3)(4x-9)$

(14) $(2x-3)(5x+7)$

178

Ex. (8) $(x+2y)(3x+y)$

(9) $(x+4y)(2x+y)$

(10) $(x+2y)(3x-4y)$

(11) $(x-3y)(3x+2y)$

(12) $(x-4y)(2x+3y)$

(13) $(x+2y)(3x-5y)$

(14) $(x-2y)(5x-7y)$

H176-180

180

(1) $2(x-3)^2$

(2) $3(x-4)^2$

(3) $a(x-4)(x+2)$

(4) $2(x-2)(x+1)$

(5) $-3(x+1)(2x-3)$

(6) $-2(x-1)(2x-3)$

179

Ex. (1) $2(x+3)(2x+1)$

(2) $2(x-1)(2x-3)$

(3) $3(x+1)(2x-5)$

(4) $3(x+5)(2x+1)$

(5) $2(x+2)(3x+2)$

(6) $2(2x-5y)(3x+2y)$

179

(7) $x(x-3)(5x-2)$

(8) $a(x-9)(x+2)$

(9) $-2a(2x+5)(2x-1)$

(10) $2a(x+1)^2$

(11) $3x(2x-1)^2$

(12) $2a(2x-3)(6x+5)$

180

(7) $2a(x+5)(x-2)$

(8) $2(2x+y)^2$

(9) $2a(3x-1)^2$

(10) $x(x-12y)(x-2y)$

(11) $a(x-2)(2x+1)$

(12) $a(3x-2)(4x+7)$

181

Ex.

(1) $(x+y)(3x+3y+5)$

(2) $(x+y)(5x+5y-2)$

Ex.

(3) $(x+y)(3+7x+7y)$

(4) $(x+y)(5-3x-3y)$

181

(5) $(x+y)(3x+3y-7)$

(6) $(x+y)(ax+ay-b)$

(7) $(x-y)(x-y-a)$

(8) $(x-y)(a+bx-by)$

(9) $(2x-y)(x^2+2xy-y^2)$

(10) $(2x+y)(1-2xy-y^2)$

182

Ex.

(1) $y(x-y)(4x-3y)$

(2) $y(x+y)(x-2y)$

(3) $x(x-y)(3x-4y)$

(4) $x(x+y)(2x+3y)$

(5) $y(x-3y)(4x-3y)$

182

Ex.

(6) $8y(x+4y)$

(7) $x^2(x-2y)$

(8) $xy(x+y)$

(9) $-9y(x+3y)$

(10) $xy^3(x-y)$

184

Ex.

(1) $a(x+y)(a+x)(a-x)$

(2) $2(x-3y)(x+2)(x-2)$

(3) $3(2x+y)(x+3)(x-3)$

(4) $3(3x-y)(1+2x)(1-2x)$

(5) $(2x+y)(xy+4a)(xy-4a)$

184

Ex.

(6) $x(2x+y)(x+y)^2$

(7) $x(x+y)(x+2y)^2$

(8) $x(3x-y)(3x-2y)^2$

(9) $2x(4x-y)(2x-y)^2$

183

Ex.

(1) $9(x-3y)(x-y)$

(2) $4(x-2y)(x+y)$

(3) $2(x-2y)(2x-3y)$

(4) $-2(x-2y)(x+y)$

183

(5) $-6(x-3y)(x+y)$

(6) $-9(3x-y)(x-y)$

Alternative Answer

$\left[9(3x-y)(y-x) \right]$

(7) $3(x-3y)(2x-y)$

(8) $6y(x-2y)(2x-3y)$

(9) $2(x-2y)(3x-7y)$

H185-188 (5-7 min)

185

Ex.

$$(1) (x-y)(x+y)(2x-y)$$

$$(2) (x-2y)(x+y)(3x-2y)$$

$$(3) (x+2y)(2x+3y)(2x+y)$$

$$(4) 3(x-4y)(x-5y)(x+y)$$

185

$$(5) (x-2y)(4x+5y)(4x-5y)$$

$$(6) x(2x-3y)(x-3y)^2$$

$$(7) x(x+y)^2(x+2y)(x-y)$$

$$(8) 2(x+y)^2(x-y)(2x+y)$$

186

$$(1) x[(a+b)+(a+c)] \\ x(2a+b+c)$$

$$(2) 3x(a+2b)$$

$$(3) 2x(a+b+c)$$

$$(4) 2(a+b)(3x-2y)$$

$$(5) (a+b)(x-5)(x+2)$$

186

$$(6) (a-b)(x-3)(2x+1)$$

$$(7) (2a+3b)(x-1)(2x-3)$$

$$(8) 2(x+4y)(x-4y)(x+2y)$$

$$(9) -3x(x+3y)(x-y)(4x+3y)$$

Alternative Answer

$$[3x(x+3y)(y-x)(3y+4x)]$$

H185-188

188

Ex.

$$(1) (a-b+c-d)(a-b-c+d)$$

$$(2) (2x+y-z)(y+z)$$

$$(3) (5x+3)(x+1)$$

$$(4) 4(4x-1)(x+3)$$

188

$$(5) (2x-y+5)(2x-y-5)$$

$$(6) 3(5x-3y)(x+y)$$

$$(7) -4(x+y)(x-2y) \\ [4(y+x)(2y-x)]$$

$$(8) -4y(x-2y)$$

$$(9) 4(2x-3)(x+2)$$

187

Ex.

$$(1) (x-y+z)(x-y-z)$$

$$(2) (x+y+3)(x+y-3)$$

$$(3) [x+(y+z)][x-(y+z)] \\ (x+y+z)(x-y-z)$$

$$(4) (x+y-z)(x-y+z)$$

$$(5) (x-4y+2z)(x-4y-2z)$$

187

Ex.

$$(6) 8(x+2y)(x-4y)$$

$$(7) 4(x-y)(x-2y)$$

$$(8) 12(x+y)(2x-3y)$$

$$(9) 3(3x-1)(x-3)$$

189

$$(1) (a^2 - 2ab + b^2) - 9x^2$$

$$(a - b)^2 - 9x^2$$

$$(a - b + 3x)(a - b - 3x)$$

$$(2) (x + y + z)(x + y - z)$$

$$(3) (x + a + b)(x - a - b)$$

$$(4) (x + y + 1)(x - y - 1)$$

189

$$(5) (2x + 2y + 1)(2x - 2y - 1)$$

$$(6) (2x - y + 1)(2x - y - 1)$$

$$(7) (3x + 3y + 1)(3x - 3y - 1)$$

$$(8) (6x + 2y + 3z)(4x - 2y - 3z)$$

$$(9) -4(2x + y - 1)(x - y - 4)$$

190

$$(1) (x + y)(3x + 3y - 4)$$

$$(2) xy(x - y)$$

$$(3) 9(3x - y)(x - y)$$

$$(4) a(x + 3y)(a + x)(a - x)$$

$$(5) x(2x + 3y)(x + 3y)^2$$

190

$$(6) (x + y)(x - y)(2x + y)$$

$$(7) (a - b)(x - 6)(x + 2)$$

$$(8) 4(2a - b)(a + b)$$

$$(9) -4(2x + y - 2)(x - y - 2)$$

$$(10) (x + 2y + 1)(x - 2y - 1)$$

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$$\text{Ex.} (1) (x + 4a + 4b)^2$$

$$(2) (x - 3a - 3b)^2$$

$$(3) (x + a + b)^2$$

$$(4) (x - a - b)^2$$

$$(5) (x - 5y - 5z)^2$$

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$$(6) (4x + a + 3b)^2$$

$$(7) (x + 4y + 5a)^2$$

$$(8) (x + y + 2a)^2$$

$$(9) (x - y)^2$$

$$(10) (5x + a + 2b)^2$$

H193-196 (5-7 min)

193	194
(1) $(x + 4y)^2$	Ex. (1) $(x + y - 6)(x + y + 1)$
(2) $(x - 4y)^2$	(2) $(x + y + 6)(x + y - 3)$
(3) $(3x + 2y)^2$	(3) $(x + y - 3)(x + y - 1)$
(4) $(3x - 2y)^2$	(4) $(x + y - 4)(x + y - 2)$
(5) $(2x - 5y)^2$	(5) $(x + y - 4)(x + y + 3)$
193	194
Ex. (6) $4(2x + 3y)^2$	(6) $(x - y - 6z)(x - y + z)$
(7) $4(3x + 5y)^2$	(7) $(x - y + 5z)(x - y - 3z)$
(8) $9(x - 4y)^2$	(8) $(x - y - 5z)(x - y - 2z)$
(9) $16(x + 5y)^2$	(9) $(x - 2y - 6z)(x - 2y + 3z)$
	(10) $(3x - y - 5z)(3x - y - 4z)$

H193-196

195	196
(1) $(5x + y)(3x + y)$	Ex. (1) $[(x + y) + 1][2(x + y) + 3]$ $(x + y + 1)(2x + 2y + 3)$
(2) $(8x - y)(x - y)$	(2) $(x + y + 5)(2x + 2y - 1)$
(3) $(7x + y)(x + y)$	(3) $(x + y + 2)(2x + 2y - 3)$
(4) $(x + 6y)(x + 5y)$	(4) $(x + y - 4)(3x + 3y - 1)$
(5) $(x + 2y)(x - 5y)$	(5) $(x + y - 2)(3x + 3y + 2)$
195	196
Ex. (6) $(6x + 5y)(3x + 2y)$	(6) $(x + y - 2)(5x + 5y + 3)$
(7) $(6x + 5y)(4x + 3y)$	(7) $(x + y - 3)(5x + 5y - 2)$
(8) $2(5x + 8y)(x + y)$	(8) $(2x + 2y - 3)(2x + 2y - 1)$
(9) $3(4x + 9y)(x + 2y)$	(9) $(x - y + 5)(3x - 3y - 1)$
	(10) $(2x - 2y + 1)(3x - 3y - 5)$

H197-200 (5-7 min)

197	198
(1) $(x + y + z)(2x + 2y + 3z)$	Ex. (1) $(a^2 + b^2)(a + b)(a - b)$
(2) $(x + y + 5z)(2x + 2y - z)$	(2) $(x^2 + 4)(x + 2)(x - 2)$
(3) $(x + y + 2z)(2x + 2y - 3z)$	(3) $(4x^2 + y^2)(2x + y)(2x - y)$
(4) $(x + y - 4z)(3x + 3y - z)$	(4) $(x^4 + y^4)(x^2 + y^2)(x + y)(x - y)$
(5) $(x + y - 2z)(3x + 3y + 2z)$	(5) $(x^4y^4 + z^4)(x^2y^2 + z^2)(xy + z)(xy - z)$
197	198
(6) $(2x + y)(7x + 2y)$	Ex. (6) $(x + 3)(x - 3)(x^2 + 4)$
(7) $(x - 2y)(3x + 2y)$	(7) $(x^2 + 9)(x + 1)(x - 1)$
(8) $(x - y)(7x + 8y)$	(8) $(x^2 + 7)(x + 2)(x - 2)$
(9) $(3x + 2y)(7x + 9y)$	(9) $(x + 3)(x - 3)(x^2 + 6)$
(10) $(x - 2y)(7x - 3y)$	(10) $(x + 2y)(x - 2y)(x^2 + 2y^2)$

H197-200

199	200
Ex. (1) $(a + b)^2(a - b)^2$	(1) $(3x + 2y)^2$
(2) $(x + 2)^2(x - 2)^2$	(2) $(5x - 12y)^2$
(3) $(x + 1)^2(x - 1)^2$	(3) $(x - y - z)^2$
(4) $(x + 3)^2(x - 3)^2$	(4) $(x - y)^2$
(5) $x(x + 1)^2(x - 1)^2$	(5) $(x + y - 6)(x + y + 3)$
199	200
(6) $(x^2 + 4y^2)(x + 2y)(x - 2y)$	(6) $(5x - 2y)(3x - 2y)$
(7) $(x + 2)(x - 2)(x^2 + 3)$	(7) $(x + y - 5)(2x + 2y + 1)$
(8) $(x + 2y)^2(x - 2y)^2$	(8) $(x + 3y)(7x + 6y)$
(9) $x(x^2 + 1)(x + 1)(x - 1)$	(9) $(x^2 + 9)(x + 3)(x - 3)$
(10) $(x + 3)(x - 3)(x + 2)(x - 2)$	(10) $(x + 3)(x - 3)(x^2 + 1)$